

# ZWZ

## Precision Series Bearings



 **WAFANGDIAN BEARING GROUP CORP., LTD**

地址：辽宁省瓦房店市北关南街一號1号

电话：0411-39111888

传真：0411-39118819

邮编：115300

http://www.zwz-bearing.com

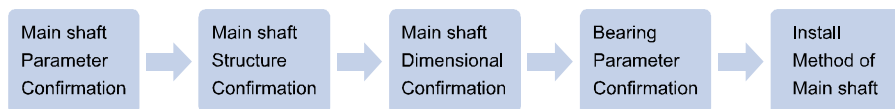
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## Precision Bearing's Type Selection for Application

The selection methods for normal bearing type can not always choose reasonable bearings for its main shaft, especially for precision bearings. This industry have extremely strict requirements.

After years of research and study by ZWZ, ZWZ developed selection method for high precision & high speed main shaft, ZWZ took advantage of this concept developed suitable precision bearing.

The suggested precision bearing type selection flow as follows:



Notes: The precision bearing's type selection based on the design parameter & structure, such as the requirements of precision level, available space, fit, system required rigidity, adapt axle direction displacement, speed, amount of heat generated. After the precision calculation then confirm the critical parameters such as, the pattern of bearing, precision level, clearance, to meet the requirement of customer.

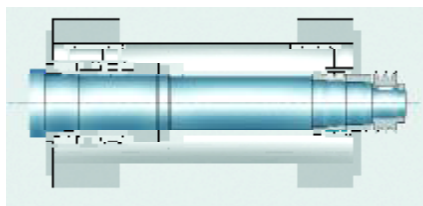
## The main shaft supporting rigidity & rotating speed comparison Chart

Table 1

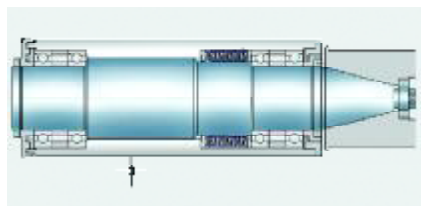
| Supporting                |             | Rotating speed parameter(mm.r/min) |                 | Rigidity(%)      |                 |
|---------------------------|-------------|------------------------------------|-----------------|------------------|-----------------|
| Working End               | Driving End | Grease Lubrication                 | Oil Lubrication | Radial direction | Axial direction |
| NN30xxK+2344 <sup>x</sup> | NN30xxK     | 0.6 x106                           | 0.8x106         | 100              | 100             |
| NN30xxK+SV <sup>x</sup>   | NN30xxK     | 0.7x106                            | 0.9x106         | 100              | 60              |
| 70xxAC/TBT                | NN30xxK     | 0.9x106                            | 1.2x106         | 80               | 50              |
| 719 xxC/QBC               | N10xxK      | 1.0x106                            | 1.3x106         | 60               | 30              |
| 70xxAC/DB                 | 70xxC/DB    | 1.1x106                            | 1.4x106         | 50               | 30              |
| 70xxC/DT                  | 70xxC/DT    | 1.3x106                            | 1.6x106         | 50               | 20              |
| 70xxAC                    | 70xxAC      | 1.4x106                            | 1.8x106         | 30               | 15              |
| 70xxC                     | 70xxC       |                                    | 3x106           | 20               | 10              |

## Case of main shaft configuration application

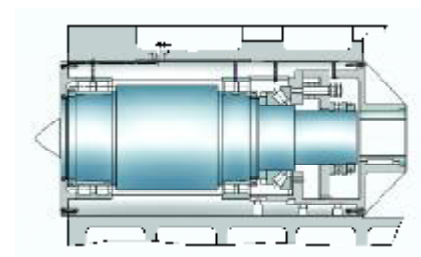
Schematic plot for turning machine main shaft assemble



Working End: NN30xxK+SV<sup>x</sup>, Driving End: NN30xxK



The configuration of High Speed Grinding Machine:  
Working End, 70xxC/DT; Driving End, 70xxC/DT



The tail shaft of the heavy turning machine: Front-End, NN30xx; Rare-End, NNU40xx+29xx

## Precision Bearing Load & Life Span Calculation

In the scope of precision bearing application, such as turning machine, the loading capacity have less effectiveness on determine the size of bearing, than the normal applications for general engineering circumstances. But while in the applications for heavy-load machining tool, pump and other heavy load or specified bearing configuration bearing type, the magnitude of load and the direction of load will have more effectiveness to the bearing dimension.

## Basic Nominal Dynamic Load

Basic nominal dynamic load indicate that the capacity of bearing resisting rolling fatigue ( Loading Capacity), refers to the pure radial load with fixed magnitude and direction (for radial bearing), under the specific circumstance of inner ring rotating and outer ring fixed (or inner ring fixed and outer ring rotating), the rated life of the bearing under this load could reach 1 million turns. The basic nominal dynamic load for radial bearings and thrust bearings are separately called radial basic nominal dynamic load and axle basic nominal dynamic load, expressed by Cr & Ca, the numerical value input to the table of bearing size . The basic nominal dynamic load which shown in the product list of angular contact ball bearing, is suitable for single set of bearing. Double , triple and quad pairs combined bearing sets' basic nominal dynamic load can get by multiple the Cr value of each single set of bearing with the coefficient listed below.

1.62 (double pairs combined bearing set)

2.16 (triple pairs combined bearing set)

2.64 (Quad pairs combined bearing set)

## Basic Rated Life

Formula (1) indicates the relationship of basic nominal dynamic load, Equivalent dynamic load, and basic rated life.

While the rotating speed is fixed, use time to show the life of bearing is more convenient, shown as formula (2)

$$\text{(Total turns)} \quad L_{10} = \left( \frac{C}{P} \right)^p \quad \dots\dots\dots (1)$$

$$\text{(Time)} \quad L_{10h} = \frac{10^6}{60n} \left( \frac{C}{P} \right)^p \quad \dots\dots\dots (2)$$

$L_{10}$  : Basic rated life,  $10^6$  turns

$L_{10h}$  : Basic rated life, h

$L_{10k}$  : Basic rated life, km

P : Equivalent Dynamic Load, N{kgf}

C : Basic Nominal Dynamic Load, N{kgf}

n : Rotating Speed, rpm

p : Life Index

Ball Bearing ..... P=3  
Roller Bearing ..... P= $\frac{10}{3}$

## Adjusted Bearing life Formula

Because of there are many factors will affect the bearing life in the real work conditions, subsequently, must adjust the bearing life based on the real working condition, the formula is shown below:

$$L_{na} = a_1 a_2 a_3 L_{10} \quad \dots\dots\dots (x)$$

$L_{na}$  : adjusted rating life,  $10^6$  turns

The life considered the bearing Feature and working conditions factor, the reliability is 100-n% ( the failure rate is n%)

$a_1$  : Reliability coefficient ..... refer to item (1)

$a_2$  : Bearing coefficient ..... refer to item (2)

$a_3$  : Bearing coefficient ..... refer to item (3)

[Notes] when selecting bearing size according to  $L_{na}$  reliability more than 90%, shall pay special attention to the strength of shaft and housing.

(1) reliability coefficient  $a_1$

When calculating the adjusted rated life, the reliability not less than 90%, the failure rate is no more than 10%, select coefficient  $a_1$  from the table below.

Table 3 Reliability Coefficient

| Reliability(%) | $L_{na}$  | $a_1$ |
|----------------|-----------|-------|
| 90             | $L_{10a}$ | 1     |
| 95             | $L_{5a}$  | 0.62  |
| 96             | $L_{4a}$  | 0.53  |
| 97             | $L_{3a}$  | 0.44  |
| 98             | $L_{2a}$  | 0.33  |
| 99             | $L_{1a}$  | 0.21  |

## Equivalent Dynamic Load

Bearing mostly bear the combined load which shaped by radial and axile load, and the load condition is in a variety of kinds, such as the vary of load.

In consequence, can not compare the real loading of bearing compare with the basic nominal dynamic load.

In this circumstance, make the real load convert to the fixed amount of imaginary load with fixed directions, which via the center of bearing, analysis and compare the same bearing life under the conditions with the imaginary load.

The convert imaginary load called equivalent dynamic load, shown as P

The equivalent dynamic load can be calculated by the formula below

$$P = XF_r + YF_a \quad (9)$$

P : Equivalent Dynamic Load, N{kgf}

$F_r$  : Radial Load, N{kgf}

$F_a$  : Axile Load, N{kgf}

X : Radial Load Coefficient

Y : Axile Load coefficient

## Choice and application of the bearing material

The performance and reliability of rolling bearings mostly depend on bearing material property. The rolling bearings are required to undergo large stress frequently on the inter face

between rings and rolling elements, meanwhile, to keep the high precision rotation. So it is required that the materials of the rings and the rolling elements possess the characteristics of hardness coinciding with loading capability, anti-fatigue and anti-wear, and dimensional steady under different conditions of rolling contact and lubrication. Too much non-metallic impurity can cause fatigue and chapping easily. The less the impurity is, the cleaner the materials are and the longer life of rolling bearings.

High carbon chrome bearing steel is generally used for the rolling bearing rings and the rolling elements. The carburizing steel is used for the bearings with high impact load and alternating bending stress.

High carbon chrome bearing steel is widely used for the rolling bearings, which are required to be through hardened, the surface and bore of the bearing both are hardened. Recently, the quality of the bearing steel is being improved, the material property is improved greatly by vacuum degassed treatment, the oxygen content and non-metal content are reduced. Electroslag refining bearing steel with higher clean degree is used for bearings with long service life and high liability.

ZWZ heat treatment technology for rolling bearing rings and rolling elements ensures the dimensional steady when under 120\*.

The cage is applied to embrace the rolling elements partially to ensure a distance between the two neighbor rollers to reduce operating friction and generated heat, keep the same distance among rolling elements and distribute load equably, to prevent rolling elements from falling off from separable bearings, and to guide rolling elements. The cages can take functions in lubrication grease storage to improve bearings' lubrication.

Cages of ZWZ precision bearing can generally divided to pressed cage, metal solid cage, nylon cage, and phenolic resin cage and so on.

ZWZ high precision bearing rolling elements are made

of high-carbon chromium steel or ceramics. Machine tools rotation speed is high, especially the machining center main shaft. In order to meet the requirement of temperature rising and rigidity under high rotation speed, the rolling elements can use ceramic material.

## Bearing limit rotational speed

The rotational speed of the bearing is mainly restricted by the increase in temperature due to the frictional heat generated inside the bearing. When the rotational speed exceeds certain limit, the bearing shall fail to continue to rotate due to the burns.

Limit rotational speed of the bearing indicates the limit value of the rotational speed when there is no frictional heat that leads to the burns and the bearing can continuously rotate.

Therefore, the limit rotational speed of the bearing is subject to the bearing type, dimensions, precision, lubrication method, quality and amount of lubricant, material and design of retaining cage, loading conditions and other factors.

The limit rotational speed for different types of bearings using grease lubrication and oil lubrication are respectively given in the dimension tables of these bearings. These values indicate the limit values of rotation speed the bearings of normal design under normal loading conditions ( $C/P \geq 13$ ,  $F_a/F_r \leq 0.25$  or so).

Following table is limitation rolling speed of bearing to different size of the bearing under Grease lubrication or oil lubrication the designed rolling speed must lower than the limited rolling speed under common load ( $C/P > 13$ ,  $F_a/F_r \leq 0.25$ ).

Otherwise: different size or grade lubrication may has better property than others, but it still cannot be used in high rolling speed bearing.

## Correction of limit rotation

Correction must be with formula (1) on limit rotational speed, when the loading condition  $C/P < 13$  (ie. the equivalent dynamic load P exceeds basic dynamic load rating C by 8% or so), or the axial load exceeds the radial load by over 25% in the combined load.

$$n_a = f_1 \cdot f_2 \cdot n \quad (1)$$

$n_a$ : revised limit\*rpm

$f_1$ : correction factors relative to loading condition (chart 1)

$f_2$ : correction factors relative to combined load (chart 2)

n: the limit rotational speed under normal load conditions, rpm (see bearing dimension tables)

C: basic static load rating, {N\*kgf}

P: Equivalent Dynamic Load, N{kgf}

$F_r$ : radial load, N{kgf}

$F_a$ : axial load, N{kgf}

## Notes for high speed rotating

When bearing is rotating with high speed, especially the rotation speed is close to or more than the limit rotation speed in the measurement chart, the following items should be pay attention to:

Consider improving the bearing precision;

(1) Consider to increase the precision level of bearing.

(2) Optimize clearance inside bearing\*Considering the decrement of clearance from temperature increase\*.

(3) For high speed rotation, suited copper alloy or phenolic resin cutting cage should be selected, in addition, there's synthetic resin forming cage fit for high speed rotation.

(4) Apply lubrication oil, grease fit for high speed, or air-oil lubrication fit for high speed.

## Lubrication and Grease

It's up to rotation condition (such as temperature or rotation speed) to select lubricant and lubrication method for a certain application, in addition, the lubrication of neighboring parts should be taken into consideration.

Proper amount of lubrication applied, lubricants could form enough lubrication membrane between rolling element and raceway. If the amount of lubrication usage is proper, hydrodynamic force friction loss will be little, the operating temperature can be kept very low. The quantity of lubrication can be accurately controlled in grease lubrication, and it's no need to design individual lubrication system, so this kind of lubrication is more and more common in main shaft configuration. However, air-oil lubrication method is recommended in extremely high speed application, since the life of lubrication grease in high speed working condition is too short.

# Rolling Bearings

## 1. Selection of lubrication grease:

a) For most precision main shaft bearing, we recommend to use mineral oil and lubrication grease with lithium base thickener. Temperature range of lubrication grease: -30~+100°C.

b) For ball screw support with thrust angular contact ball bearing, we recommend to use calcium base mixed thickener grease.

c) If bear heavy load or impact stress, it may need to change lubrication grease.

d) When waterproofness should be taken into consideration, we recommend to use calcium base mixed thickener grease.

## 2. Grease injection volume

ZWZ recommend to use little grease for bearings in high

speed rotation. The grease usage should be less than 30%for high speed main shaft bearings for machine tools. According to practical experience, ZWZ recommend to use 10%~15% grease of the internal bearing space which rotation speed more than 3000rpm.

If customer's working condition is special, ZWZ can recommend suitable lubrication grease type and injection volume according to the working condition.

## Bearing fit selection instruction

In order to take full use of the capability of precision bearing, axle and bearing sear and relative parts should be in high precision class. Attached list is recommendation for fit and precision from ZWZ.

Fit with axle

chart 2

| Bearing form                                                | Axle OD |     | Axle OD tolerance |       | Fit tolerance |     |
|-------------------------------------------------------------|---------|-----|-------------------|-------|---------------|-----|
|                                                             | over    | to  | min               | max   | min           | max |
| main shaft bearing                                          | 10      | 18  | -0.003            | 0     | -0.002        | 0   |
|                                                             | 18      | 50  | -0.004            | 0     | -0.0025       | 0   |
|                                                             | 50      | 80  | -0.005            | 0     | -0.003        | 0   |
|                                                             | 80      | 120 | -0.003            | 0.003 | -0.004        | 0   |
|                                                             | 120     | 180 | -0.004            | 0.004 | -0.004        | 0   |
|                                                             | 180     | 250 | -0.005            | 0.005 | -0.005        | 0   |
| Ball screw support with thrust angular contact ball bearing | 10      | 18  | -0.008            | 0     | -             | -   |
|                                                             | 18      | 50  | -0.009            | 0     | -             | -   |
|                                                             | 50      | 80  | -0.011            | 0     | -             | -   |
|                                                             | 80      | 120 | -0.013            | 0     | -             | -   |
|                                                             |         |     | -0.015            | 0     | -             | -   |

Precision and roughness for axle

chart 3

| Diameter of axle |     | Precision and roughness of axle |     |                 |     |                 |     |                 |     |                 |     |
|------------------|-----|---------------------------------|-----|-----------------|-----|-----------------|-----|-----------------|-----|-----------------|-----|
|                  |     | roundness                       |     | Cylindricity    |     | Run out         |     | Axiality        |     | Roughness       |     |
|                  |     | Precision class                 |     | Precision class |     | Precision class |     | Precision class |     | Precision class |     |
| over             | to  | P5,P4                           | P2  | P5,P4           | P2  | P5,P4           | P2  | P5,P4           | P2  | P5,P4           | P2  |
| -                | 10  | 0.7                             | 0.5 | 0.7             | 0.5 | 2               | 1.2 | 4               | 2.5 | 0.2             | 0.1 |
| 10               | 18  | 1                               | 0.6 | 1               | 0.6 | 2.5             | 1.5 | 5               | 3   | 0.2             | 0.1 |
| 18               | 30  | 1.2                             | 0.7 | 1.2             | 0.7 | 3               | 2   | 6               | 4   | 0.2             | 0.1 |
| 30               | 50  | 1.2                             | 0.7 | 1.2             | 0.7 | 3.5             | 2   | 7               | 4   | 0.2             | 0.1 |
| 50               | 80  | 1.5                             | 1   | 1.5             | 1   | 4               | 2.5 | 8               | 5   | 0.2             | 0.1 |
| 80               | 120 | 2                               | 1.2 | 2               | 1.2 | 5               | 3   | 10              | 6   | 0.4             | 0.2 |
| 120              | 180 | 2.5                             | 1.7 | 2.5             | 1.7 | 6               | 4   | 12              | 8   | 0.4             | 0.2 |
| 180              | 250 | 3.5                             | 2.2 | 3.5             | 2.2 | 7               | 5   | 14              | 10  | 0.4             | 0.2 |
| 250              | 315 | 4                               | 3   | 4               | 3   | 8               | 6   | 16              | 12  | 0.4             | 0.2 |

Fit with bearing housing

chart 4

| Bearing form                                                | ID of bearing housing |     | ID tolerance of bearing housing |                 | Fit tolerance   |                 |
|-------------------------------------------------------------|-----------------------|-----|---------------------------------|-----------------|-----------------|-----------------|
|                                                             | over                  | to  | Lower deviation                 | Upper deviation | Lower deviation | Upper deviation |
| Angular contact ball bearing (work side)                    | 18                    | 50  | -0.002                          | 0.002           | 0.002           | 0.006           |
|                                                             | 50                    | 80  | -0.0025                         | 0.0025          | 0.002           | 0.006           |
|                                                             | 80                    | 120 | -0.003                          | 0.003           | 0.003           | 0.008           |
|                                                             | 120                   | 180 | -0.004                          | 0.004           | 0.003           | 0.008           |
|                                                             | 180                   | 250 | -0.005                          | 0.005           | 0.005           | 0.010           |
| Angular contact ball bearing (free side)                    | 18                    | 50  | 0                               | 0.004           | 0.006           | 0.011           |
|                                                             | 50                    | 80  | 0                               | 0.005           | 0.006           | 0.011           |
|                                                             | 80                    | 120 | 0                               | 0.006           | 0.009           | 0.015           |
|                                                             | 120                   | 180 | 0                               | 0.008           | 0.009           | 0.015           |
|                                                             | 180                   | 250 | 0                               | 0.010           | 0.015           | 0.022           |
| Cylindrical roller bearing                                  | 18                    | 50  | -0.006                          | 0               | -0.002          | 0.002           |
|                                                             | 50                    | 80  | -0.007                          | 0               | -0.002          | 0.002           |
|                                                             | 80                    | 120 | -0.008                          | 0               | -0.002          | 0.002           |
|                                                             | 120                   | 180 | -0.009                          | 0               | -0.002          | 0.002           |
|                                                             | 180                   | 250 | -0.011                          | 0               | -0.002          | 0.002           |
| Ball screw support with thrust angular contact ball bearing | 10                    | 18  | -                               | -               | -               | -               |
|                                                             | 18                    | 30  | -                               | -               | -               | -               |
|                                                             | 30                    | 50  | 0                               | 0.016           | -               | -               |
|                                                             | 50                    | 80  | 0                               | 0.019           | -               | -               |
|                                                             | 80                    | 120 | 0                               | 0.022           | -               | -               |

Bearing housing precision and roughness

Chart 5

| Diameter of axle |     | Precision and roughness of axle |     |                 |     |                 |     |                 |    |                 |     |
|------------------|-----|---------------------------------|-----|-----------------|-----|-----------------|-----|-----------------|----|-----------------|-----|
|                  |     | roundness                       |     | Cylindricity    |     | Run out         |     | Axiality        |    | Roughness       |     |
|                  |     | Precision class                 |     | Precision class |     | Precision class |     | Precision class |    | Precision class |     |
| over             | to  | P5,P4                           | P2  | P5,P4           | P2  | P5,P4           | P2  | P5,P4           | P2 | P5,P4           | P2  |
| 10               | 18  | 1                               | 0.6 | 1               | 0.6 | 2.5             | 1.5 | 5               | 3  | 0.4             | 0.2 |
| 18               | 30  | 1.2                             | 0.7 | 1.2             | 0.7 | 3               | 2   | 6               | 4  | 0.4             | 0.2 |
| 30               | 50  | 1.2                             | 0.7 | 1.2             | 0.7 | 3.5             | 2   | 7               | 4  | 0.4             | 0.2 |
| 50               | 80  | 1.5                             | 1   | 1.5             | 1   | 4               | 2.5 | 8               | 5  | 0.4             | 0.2 |
| 80               | 120 | 2                               | 1.2 | 2               | 1.2 | 5               | 3   | 10              | 6  | 0.8             | 0.4 |
| 120              | 180 | 2.5                             | 1.7 | 2.5             | 1.7 | 6               | 4   | 12              | 8  | 0.8             | 0.4 |
| 180              | 250 | 3.5                             | 2.2 | 3.5             | 2.2 | 7               | 5   | 14              | 10 | 0.8             | 0.4 |
| 250              | 315 | 4                               | 3   | 4               | 3   | 8               | 6   | 16              | 12 | 1.6             | 0.8 |
| 315              | 400 | 4.5                             | 3.5 | 4.5             | 3.5 | 9               | 6.5 | 18              | 13 | 1.6             | 0.8 |

Note: diagram for supplement for upper axle and bearing housing precision roughness.

## Bearing mounting

### 1.Preparation of the bearing mounting

#### 1.1 The ambient of bearing mounting.

The mounting of the bearing shall be done in dry and dust free room, mounting work also shall be away from the equipments with metalworking or generating metal debris and dust.

Bearing mounting must be done without any protection happens to (large size bearings always experience), proper protective measures must be taken to protect the bearings from dust and humid air until the mounting is finished.

#### 1.2 Preparation of the bearing

Do not open the packing of the bearing until mounting operation since the bearing has received rust-prevention handling and been properly packaged. In addition, the rust-preventive oil on the bearing have good lubricant performance, for the bearings of general applications or filled with lubricating grease, there is no need of washing before using the bearing. But for the bearings applied to the instrument or rotating at high speed, washing with cleaning oil should be used to rid the bearings of the rust-preventive oil. In this case, the bearings may easily get rusty, therefore they should not be kept for a long time.

#### 1.3 The preparation of mounting tools

The mounting tools should be made from wood or light metal. The materials which can generate the chips should

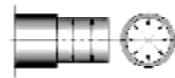
be avoided. The mounting tools should be kept clean.

#### 1.4 The inspection on the shaft and housing

Wash the shaft and housing to ensure there is no burrs or scratches from machining. There should be no grinding agents (SiC, AL<sub>2</sub>O<sub>3</sub> and so on), foundry sand or smear metal in the housing.

The check if the dimension, shape and the processing quality of the shaft and the housing are in conformity with the drawings.

As shown in Figure 1 and 2, measuring should be done at several places. Also it is necessary to inspect the dimension of the fillet and the verticality of the abutment. Before mounting, lubricate the qualified shaft and housing on all the fit surfaces.



Picture 1



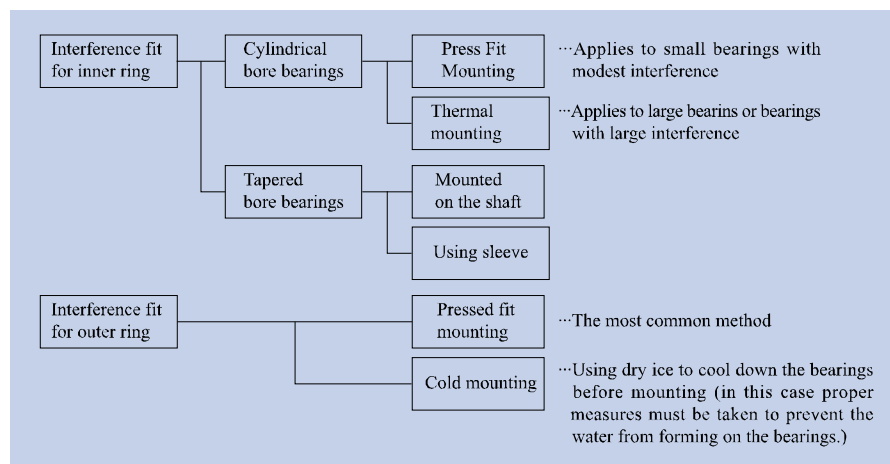
Picture 2

Picture 1: The measuring position of the shaft diameter

Picture 2: The measuring position of the housing bore diameter

## 2. The classification of the bearings mounting method

The bearing mounting methods vary with the bearing types and the fit conditions. Since in the most cases it is the shaft that rotates.



## 3. The mounting of the cylindrical core bearings

### 3.1 Press fit mounting

Hydraulic press is normally used, sometimes nuts and screws are also employed. Hammers can be used only when there have no alternative options. When the inner ring of the bearing is interference fit and mounted on shaft, the pressure should be applied on the inner ring. When the outer ring of the bearing is interference fit and mounted on the housing, the pressure should be applied on the outer ring.

When the inner and the outer ring is interference fit, a shim plate must be used to make sure pressure applied on both inner ring and outer ring simultaneously.

### 3.2 Thermal mounting

This method heats the bearings to make it expand and then mounts the bearing on the shaft. It can prevent the bearings from being affected by unnecessary external forces and finish the mounting within very short time. The heating methods mainly are oil bath and induction.

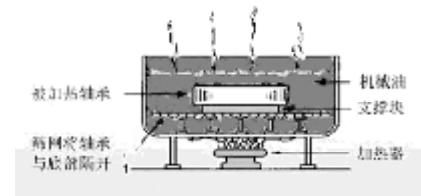


Chart 3 Oil bath heat method

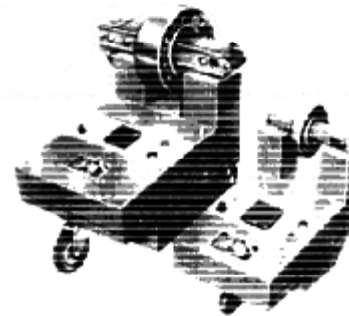


Chart 4 Induction heating method

The advantage of the electric induction heating

- 1) Clear, no pollution
- 2) Timing, constant temperature
- 3) Easy operation

When the bearing is heated to the expected temperature (below 120\*), take it out and mount it on the shaft. The bearing will be shrink along with the cooling. Sometimes there will be gap between the shaft shoulder and the bearing end face, therefore the bearing should be pushed by the tools toward the bearing shoulder.

Due to the pre-lubricated grease or sealing material has limitation with the temperature, the heating temperature should not over 80\* and the oil bath method could not be used. Make sure the temperature is distributed uniformly when heating the bearing and no partly overheated conditions.

## 4. The mounting of tapered bore bearing

Most of the tapered bore bearings are mounted with interference fit of inner ring.

The tapered bore bearing can be directly mounted to tapered shaft or to cylindrical shaft through adapter sleeve and withdrawal sleeve.

Interference degree is defined by checking the clearance decreased volume or the axial displacement of the inner ring on the tapered shaft. On certain circumstances, it can be defined by testing the lock angle of the locknut or the expansion volume of the inner ring.

As for the tapered core bearing, when the inner ring is pressed on the tapered shaft, adapter sleeve or withdrawal sleeve, interference degree will be increased and the radial clearance will be decreased. The interference degree can be defined by checking the decreased volume of the radial clearance.

### 4.1 Measure of the clearance decreased volume

The method of using feeler gauge to check the radial clearance before and after the mounting is only suitable for medium size or extra large size bearings. The measure of the clearance must be at the position between the unloaded rollers and the outer ring raceway. Before measuring, running the outer ring for several revolutions, and make sure the central lines of the outer ring and roller group are overlapped. In the first measure, feeler gauge should have a measuring value lower than the minimum value of the clearance, and then choose a thicker feeler gauge to measure the clearance for several times until the feeler gauge meet the resistance in the following situation when being moved. Before mounting - measuring place is between outer ring



# Rolling Bearings

and the highest roller.

After mounting -measuring place is between the inner ring and the lowest roller according to different cages.

## 5. Mounting of the outer ring

When mounting the outer ring to bearing housing with

interference fit,for the small size bearing,the outer ring can be pressed in normal temperature.When interference is big,the outer ring can be pressed through heating bearinghousing or cooling outer ring.When applying the dry ice or other refrigerant,the moisture in the air will agglomerate on the bearing,anti-rust measures must be taken.

## Postposition Code

Table 6

| Code        | Measuring                                                                                                                                                                                                                                                                                                                       |
|-------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| -1, -2, ... | Indicates series of non-standard X1,X2,YA2...                                                                                                                                                                                                                                                                                   |
| A           | 1.angular contact ball bearing with normal contact angle of $\alpha=30^\circ$<br>2.Tapered roller bearings with contact angle and outer ring raceway diameter D1 not conforming to national standards,and use A,A1,A2...to indicate when more than two non-national-standard a or D1 occurred in a code.<br>3.Outer ring guided |
| AC          | Angular contact ball bearing with normal contact angle of $\alpha=25^\circ$                                                                                                                                                                                                                                                     |
| B           | 1. Angular contact ball bearing with normal contact angle of $\alpha=40^\circ$<br>2.Tapered roller bearing with bigger contact angle.<br>3.Inner ring guided                                                                                                                                                                    |
| C           | 1. Angular contact ball bearing with normal contact angle of $\alpha=15^\circ$<br>2.Aligning roller bearings with central rib,paralleled rollers and pressed cage,inner ring without rib<br>3.Matched tapered roller bearings, mean value of axial clearance added directly after C if not conforming to ZWZ standards          |
| CA          | Aligning roller bearings with central rib ,paralleled rollers and brass solid cage,inner ring without rib<br>Clearance of deep groove ball bearings for motors                                                                                                                                                                  |
| /CM         | 0 group clearance. /CN combined with                                                                                                                                                                                                                                                                                            |
| /CN         | H, M or L indicates half of the clearance,combined with P*indicates the clearance shifting.<br>For example:<br>/CNM indicates half of 0 group clearance at the middle part<br>/CNL indicates half of 0 group clearance at the lower part<br>/CNP indicates the upper part of 0 group clearance and the lower part of C3 group   |
| /C1         | Clearance conforms to the standard group 1                                                                                                                                                                                                                                                                                      |
| /C2         | Clearance conforms to the standard group 2                                                                                                                                                                                                                                                                                      |
| /C9         | Bearing clearance does not conform to the present standard<br>When two or more clearances in one code are different from present standard,it will be indicated with added digits,such as C91,C92..                                                                                                                              |

| Code | Measuring                                                                                                                                                                                                                                                                                                                                                                                                                          |
|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| /CR  | When matched tapered roller bearings have radial clearance,the mean value of clearance will be added after CR.<br>1.Double-row angular contact ball bearing,double inner ring ,contact angle $\alpha=45^\circ$<br>2.Double row tapered roller bearing,no inner spacer or outer spacer un-grinded end face.<br>3.Inch tapered roller bearing,inner ring with double raceways or outer ring with double raceways.<br>4.Split bearing |
| D    | Two angular contact ball bearings or tapered roller bearings used for face to face paired mounting.                                                                                                                                                                                                                                                                                                                                |
| /DB  | Two single deep groove ball bearings angular contact ball bearings or tapered roller ball bearings used for face to face paired mounting.                                                                                                                                                                                                                                                                                          |
| /DF  | Two angular contact ball bearings or tapered roller bearings used to same direction tandem paired mounting.                                                                                                                                                                                                                                                                                                                        |
| /DT  | Inside design is changed ,belonging to reinforced type.                                                                                                                                                                                                                                                                                                                                                                            |
| E    | Ring, rolling elements and cage or only the ring and rolling elements are made from vacuum smelted bearing steel.                                                                                                                                                                                                                                                                                                                  |
| HA   | Ring and rolling elements or only ring or rolling elements are made from case hardened steel (/HC-20Cr2Ni4A; /HC1-20Cr2Mn2MoA; /HC2-15Mn).                                                                                                                                                                                                                                                                                         |
| /HC  | Ring,rolling elements and cage or only the ring and rolling elements are made from electroslag remelting bearing steel (military first grade steel)ZGCr15.                                                                                                                                                                                                                                                                         |
| /HE  | Ring and rolling elements or only rolling elements are made from other bearing steel (/HG-5GrMnMo; /HG1-55SiMoVA; /HG2-GCr18Mo; /HG3-42CrMo).                                                                                                                                                                                                                                                                                      |
| /HG  | Ring and the rolling elements are made from unusual materials (/HQ-plastic; /HQ1-ceramic alloy)                                                                                                                                                                                                                                                                                                                                    |
| HQ   | Pressed steel cage.When the material changes,it is indicated with the added digits.                                                                                                                                                                                                                                                                                                                                                |
| J    | Pressed steel cage,outer ring guided.                                                                                                                                                                                                                                                                                                                                                                                              |
| JA   | Tapered core bearing, conicity is 1:12                                                                                                                                                                                                                                                                                                                                                                                             |
| K    | Tapered core bearing, conicity is 1:30                                                                                                                                                                                                                                                                                                                                                                                             |
| K30  | Light alloy solid cage. When the material of the cage changes,it is indicated by the added digits.                                                                                                                                                                                                                                                                                                                                 |
| L    | Zinc aluminum alloy ZnAl27Cu2                                                                                                                                                                                                                                                                                                                                                                                                      |
| L3   | Light alloy solid cage, outer ring guided                                                                                                                                                                                                                                                                                                                                                                                          |
| LA   | Light alloy solid cage, inner ring guided                                                                                                                                                                                                                                                                                                                                                                                          |
| LB   | Brass solid cage                                                                                                                                                                                                                                                                                                                                                                                                                   |
| M    | Brass solid cage, outer ring guided                                                                                                                                                                                                                                                                                                                                                                                                |
| MA   | Brass solid cage,inner ring guided                                                                                                                                                                                                                                                                                                                                                                                                 |

| Code | Measuring                                                                                                                                                                                                                         |
|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| MB   | Bearing with snap groove on the outer ring                                                                                                                                                                                        |
| N    | Tolerance grade conforms to standard PO,code is omitted.                                                                                                                                                                          |
| /P0  | Tolerance grade conforms to standard P6                                                                                                                                                                                           |
| /P6  | Tolerance grade conforms to standard P6X                                                                                                                                                                                          |
| /P6X | Tolerance grade conforms to standard P5                                                                                                                                                                                           |
| /P5  | Tolerance grade conforms to standard P4<br>Tolerance grade conforms to standard P2<br>Bronze solid cage,indicated with appended digitals ,means different material                                                                |
| /P4  | Q1-aluminum iron manganese bronze<br>Q2-silicon iron zinc bronze                                                                                                                                                                  |
| /P2  | Q3-silicon nickel bronze<br>Q4-aluminum bronze                                                                                                                                                                                    |
| Q    | Q5-stannum bronze*ZQSn10-1*                                                                                                                                                                                                       |
| /QB  | Four sets of bearings in pair tandem matched and back to back mounting                                                                                                                                                            |
| /QF  | Four sets of bearings in pair tandem matched and face to face mounting                                                                                                                                                            |
| /QT  | Four sets of bearings in tandem mounting                                                                                                                                                                                          |
| /QBT | Four sets of bearings,three in tandem and one in back to back mounting                                                                                                                                                            |
| /QFT | Four sets of bearings,three in tandem and one in face to face mounting<br>Super precision grade*dimension tolerance equals to P5,rotating tolerance equals to P4.<br>Solid cage with phenolic coat,outer ring guided.             |
| /SP  | Solid cage with phenolic coat,inner ring guided.                                                                                                                                                                                  |
| TA   | Three sets of bearings in tandem and back to back mounting                                                                                                                                                                        |
| TB   | Three sets of bearings in tandem and face to face mounting<br>Class fiber reinforced phenolic cage                                                                                                                                |
| /TBT | Engineering plastic cage                                                                                                                                                                                                          |
| /TFT | TN1-nylon<br>TN2-polyamide(PA)                                                                                                                                                                                                    |
| TH   | TN3-polyimide<br>TN4-polycarbonate<br>TN5-paraformaldehyde                                                                                                                                                                        |
| TN   | Three sets of bearings in tandem mounting                                                                                                                                                                                         |
| /TT  | Thrust ball bearing with spherical seat washer<br>Super precision grade*dimension tolerance equals to P4 *rotating tolerance is higher than P4.                                                                                   |
| U    | Bearing vibrating speed group*The appended digitals indicate different groups.<br>V1-vibrating speed group conforms to V1 group<br>V2-vibrating speed group conforms to V2 group<br>V3-vibrating speed group conforms to V3 group |

| Code  | Measuring                                                                                                                                                                                                                                                                                                                                                                          |
|-------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| /V    | Bearing with oil slot and three lubricating oil holes on the outer ring<br>Bearing with oil slot and four lubricating oil holes on the outer ring                                                                                                                                                                                                                                  |
| /W33  | Non-standard outside diameter<br>Non-standard outside width(height).                                                                                                                                                                                                                                                                                                               |
| /W33A | Non-standard outside diameter,width<br>(height)(standard bore diameter)                                                                                                                                                                                                                                                                                                            |
| X1    | Y combines with another letter (such as YA,YB) or more digitals to identify the change of the non-series which can not be indicated with the present suffix code.                                                                                                                                                                                                                  |
| X2    | YA-structure change                                                                                                                                                                                                                                                                                                                                                                |
| X3    | YA1-outside surface of the outer ring is different from standard design.<br>YA2-bore of inner ring is different from standard design.<br>YA3-end face of the bearing ring is different from standard design.<br>YA4-raceway of the bearing ring is different from standard design.<br>YA5-rolling element of the bearing is different from standard design.                        |
| /Y    | YAB-structure and the technical specification changes simultaneously.<br>YAD-one type of the bearing has two or more changes on structure.                                                                                                                                                                                                                                         |
|       | YB-technical specification changes<br>YB1-surface of the bearing ring has the coating<br>YB2-bearing dimension and tolerance changes<br>YB3-surface roughness degree of the bearing ring changes<br>YB4-heat treatment (e.g.harness)changes<br>YB5-position tolerance has special requirements.<br>YBD-one type of the bearing has two or more changes on technical specification. |
| Z     | Bearing vibrating acceleration rating group.The appended digital indicates different groups.<br>Z1-vibrating acceleration rating group conforms to Z1 group<br>Z2-vibrating acceleration rating group conforms to Z2 group<br>Z3-vibrating acceleration rating group conforms to Z3 group                                                                                          |

## Double row cylindrical roller bearing

### 1. Structure characteristic

Double row cylindrical roller bearing adopt to main bearing of machine for high stiffness requirement. on the work side of main bearing apply double cylindrical roller bearing ,for easy to adjust and make the radial clearance after install, it is normally used by tapered bore bearing.

There are two series ZWZ precision double cylindrical roller bearing mainly: 30 (NN, NNU) series and 49(NN, NNU) series. NNU49 series have the compact dimension, it is the better chosen when the space is limited; NN30series achieved the balance between speed and high stiffness, it is one of the bearing series in common use,special for the back side supporting to the main shaft.

### 2. Tapered Bore

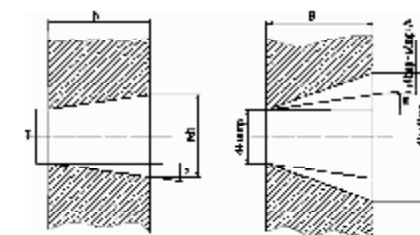


Chart 3 theoretical tapered bore

chart 4 Tapered bore with actual mean diameter and its deviation



tapered 1:12:

Nominal half tapered angle  $\alpha=2^{\circ} 23' 9.4''=2.38594^{\circ}$   
 $=0.041643$  Radian

Basic diameter of theoretical large end of tapered bore

$$d1 = d + \frac{1}{12} B$$

tapered 1: 30:

Nominal half tapered angle  $\alpha=0^{\circ} 57' 17.4''=$   
 $0.95484^{\circ} = 0.01667$  Radian

Basic diameter of theoretical large end of tapered bore

$$d1 = d + \frac{1}{30} B$$

The tolerance of tapered bore includes:

- mean diameter tolerance indicated by limit value of actual mean diameter deviation  $\Delta d_{mp}$  of theoretical small end of tapered bore.

-Tapered tolerance indicated by limit value of the difference of actual mean diameter deviation of two ends of tapered bore.

-Diameter variation tolerance indicated by maximum value of inner diameter variation  $V_{dp}$  on any radial plain of tapered bore.

## SP level Tolerance

Table 7 Tapered bore (1:12)

$\mu m$

| d<br>mm |     | $\Delta d_{mp}$ |                 | $\Delta d_{1mp} - \Delta d_{mp}$ |                 | $V_{dp}$ |
|---------|-----|-----------------|-----------------|----------------------------------|-----------------|----------|
| From    | to  | Upper deviation | Lower deviation | Upper deviation                  | Lower deviation | max      |
| 18      | 30  | +10             | 0               | +4                               | +1              | 3        |
| 30      | 50  | +12             | 0               | +4                               | +1              | 4        |
| 50      | 80  | +15             | 0               | +4                               | +1              | 5        |
| 80      | 120 | +20             | 0               | +7                               | +2              | 5        |
| 120     | 180 | +25             | 0               | +7                               | +2              | 7        |
| 180     | 250 | +30             | 0               | +8                               | +2              | 8        |
| 250     | 315 | +35             | 0               | +10                              | +2              | 9        |

## UP level tolerance

Table 8 Tapered bore (1:12)

$\mu m$

| d<br>mm |     | $\Delta d_{mp}$ |                 | $\Delta d_{1mp} - \Delta d_{mp}$ |                 | $V_{dp}$ |
|---------|-----|-----------------|-----------------|----------------------------------|-----------------|----------|
| From    | to  | Upper deviation | Lower deviation | Upper deviation                  | Lower deviation | max      |
| 18      | 30  | +6              | 0               | +3                               | +1              | 2        |
| 30      | 50  | +8              | 0               | +3                               | +1              | 3        |
| 50      | 80  | +9              | 0               | +3                               | +1              | 3        |
| 80      | 120 | +10             | 0               | +4                               | +2              | 4        |
| 120     | 180 | +13             | 0               | +4                               | +2              | 5        |
| 180     | 250 | +15             | 0               | +5                               | +2              | 7        |
| 250     | 315 | +18             | 0               | +5                               | +2              | 9        |

## 3. Radial clearance

Table 9 Radial clearance of cylindrical clarence of double-row cylindrical roller bearing.

$\mu m$

| Nominal ID<br>d mm |     | Clearance |     |         |     |         |     |
|--------------------|-----|-----------|-----|---------|-----|---------|-----|
|                    |     | Group 1   |     | Group 2 |     | Group 3 |     |
| From               | to  | Min       | Max | Min     | Max | Min     | max |
| 24                 | 24  | 5         | 15  | 10      | 20  | 20      | 30  |
| 24                 | 30  | 5         | 15  | 10      | 25  | 25      | 35  |
| 30                 | 40  | 5         | 15  | 12      | 25  | 25      | 40  |
| 40                 | 50  | 5         | 18  | 15      | 30  | 30      | 45  |
| 50                 | 65  | 5         | 20  | 15      | 35  | 35      | 50  |
| 65                 | 80  | 10        | 25  | 20      | 40  | 40      | 60  |
| 80                 | 100 | 10        | 30  | 25      | 45  | 45      | 70  |
| 100                | 120 | 10        | 30  | 25      | 50  | 50      | 80  |
| 120                | 140 | 10        | 35  | 30      | 60  | 60      | 90  |
| 140                | 160 | 10        | 35  | 35      | 65  | 65      | 100 |
| 160                | 180 | 10        | 40  | 35      | 75  | 75      | 110 |
| 180                | 200 | 15        | 45  | 40      | 80  | 80      | 120 |
| 200                | 225 | 15        | 50  | 45      | 90  | 90      | 135 |
| 225                | 250 | 15        | 50  | 50      | 100 | 100     | 150 |
| 250                | 280 | 20        | 55  | 55      | 110 | 110     | 165 |
| 280                | 315 | 20        | 60  | 60      | 120 | 120     | 180 |
| 315                | 355 | 20        | 65  | 65      | 135 | 135     | 200 |
| 355                | 400 | 25        | 75  | 75      | 150 | 150     | 225 |
| 400                | 450 | 25        | 85  | 85      | 170 | 170     | 255 |
| 450                | 500 | 25        | 95  | 95      | 190 | 190     | 285 |

Table 10 Radial clearance of taper hole double row cylindrical roller bearing.

$\mu m$

| Nominal ID<br>d mm |     | Clearance |     |         |     |
|--------------------|-----|-----------|-----|---------|-----|
|                    |     | Group 1   |     | Group 2 |     |
| From               | to  | Min       | Max | Min     | Max |
| 24                 | 24  | 10        | 20  | 20      | 30  |
| 24                 | 30  | 15        | 25  | 25      | 35  |
| 30                 | 40  | 15        | 25  | 25      | 40  |
| 40                 | 50  | 17        | 30  | 30      | 45  |
| 50                 | 65  | 20        | 35  | 35      | 50  |
| 65                 | 80  | 25        | 40  | 40      | 60  |
| 80                 | 100 | 35        | 55  | 45      | 70  |
| 100                | 120 | 40        | 60  | 50      | 80  |
| 120                | 140 | 45        | 70  | 60      | 90  |
| 140                | 160 | 50        | 75  | 65      | 100 |
| 160                | 180 | 55        | 85  | 75      | 110 |
| 180                | 200 | 60        | 90  | 80      | 120 |
| 200                | 225 | 60        | 95  | 90      | 135 |
| 225                | 250 | 65        | 100 | 100     | 150 |
| 250                | 280 | 75        | 110 | 110     | 165 |
| 280                | 315 | 80        | 120 | 120     | 180 |
| 315                | 355 | 90        | 135 | 135     | 200 |
| 355                | 400 | 100       | 150 | 150     | 225 |
| 400                | 450 | 110       | 170 | 170     | 255 |
| 450                | 500 | 120       | 190 | 190     | 285 |

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## Tolerance

Except the tolerance according to GB/T307.1 ,ZWZ provide precision double row cylindrical roller bearing with with the tolerance level SP and UP. SP and UP tolerance value are shown in the table (X) 11.

Table 11 Inner Ring

SP level

| Nominal ID<br>d mm |     | $\Delta ds$ |     | Vdp | $\Delta Bs$ |      | VBs | Kia | Sd  |
|--------------------|-----|-------------|-----|-----|-------------|------|-----|-----|-----|
| From               | to  | High        | Low | Max | High        | Low  | Max | Max | Max |
| -                  | 18  | 0           | -5  | 3   | 0           | -100 | 5   | 3   | 8   |
| 18                 | 30  | 0           | -6  | 3   | 0           | -100 | 5   | 3   | 8   |
| 30                 | 50  | 0           | -8  | 4   | 0           | -120 | 5   | 4   | 8   |
| 50                 | 80  | 0           | -9  | 5   | 0           | -150 | 4   | 4   | 8   |
| 80                 | 120 | 0           | -10 | 5   | 0           | -200 | 7   | 5   | 3   |
| 120                | 180 | 0           | -13 | 7   | 0           | -250 | 8   | 6   | 10  |
| 180                | 250 | 0           | -15 | 8   | 0           | -300 | 10  | 8   | 11  |
| 250                | 315 | 0           | -18 | 9   | 0           | -350 | 13  | 8   | 13  |

Table 12 Outer ring

SP level

| Nominal ID<br>D mm |     | $\Delta Ds$ |     | VDP | $\Delta Cs$                                    |     | Vcs | Kea | S <sub>D</sub> |
|--------------------|-----|-------------|-----|-----|------------------------------------------------|-----|-----|-----|----------------|
| From               | to  | High        | Low | Max | High                                           | Low | Max | Max | Max            |
| 30                 | 50  | 0           | -7  | 4   | The value is the same as inner ring of bearing |     | 5   | 5   | 8              |
| 50                 | 80  | 0           | -9  | 5   |                                                |     | 6   | 5   | 8              |
| 80                 | 120 | 0           | -10 | 5   |                                                |     | 7   | 6   | 9              |
| 120                | 150 | 0           | -11 | 6   |                                                |     | 7   | 7   | 10             |
| 150                | 180 | 0           | -13 | 7   |                                                |     | 8   | 8   | 10             |
| 180                | 250 | 0           | -15 | 8   |                                                |     | 10  | 10  | 11             |
| 250                | 315 | 0           | -18 | 9   |                                                |     | 13  | 11  | 13             |
| 315                | 400 | 0           | -20 | 10  |                                                |     | 15  | 13  | 13             |
| 400                | 500 | 0           | -23 | 12  |                                                |     | 25  | 15  | 15             |

Table 13 Inner ring

SP level

| Nominal ID<br>d mm |     | $\Delta ds$ |     | Vdp | $\Delta Bs$ |     | VBs | Kia | S <sub>d</sub> |
|--------------------|-----|-------------|-----|-----|-------------|-----|-----|-----|----------------|
| From               | to  | High        | Low | Max | High        | Low | Max | Max | Max            |
| -                  | 18  | 0           | -4  | 2   | 0           | -25 | 1.5 | 1.5 | 2              |
| 18                 | 30  | 0           | -5  | 3   | 0           | -25 | 1.5 | 1.5 | 3              |
| 30                 | 50  | 0           | -6  | 3   | 0           | -30 | 2   | 2   | 3              |
| 50                 | 80  | 0           | -7  | 4   | 0           | -40 | 3   | 2   | 4              |
| 80                 | 120 | 0           | -8  | 4   | 0           | -50 | 3   | 3   | 4              |
| 120                | 180 | 0           | -10 | 5   | 0           | -60 | 4   | 3   | 5              |
| 180                | 250 | 0           | -12 | 6   | 0           | -75 | 5   | 4   | 6              |
| 250                | 315 | 0           | -18 | 9   | 0           | -90 | 6   | 5   | 6              |

Table 14 Outer ring

SP level

| Nominal ID<br>D mm |     | $\Delta Ds$ |     | VDp | $\Delta Cs$                                    |     | Vcs | Kea | S <sub>D</sub> |
|--------------------|-----|-------------|-----|-----|------------------------------------------------|-----|-----|-----|----------------|
| From               | to  | High        | Low | Max | High                                           | Low | Max | Max | Max            |
| 30                 | 50  | 0           | -5  | 3   | The value is the same as inner ring of bearing |     | 2   | 3   | 2              |
| 50                 | 80  | 0           | -6  | 3   |                                                |     | 3   | 3   | 2              |
| 80                 | 120 | 0           | -7  | 4   |                                                |     | 3   | 3   | 3              |
| 120                | 150 | 0           | -8  | 4   |                                                |     | 4   | 4   | 3              |
| 150                | 180 | 0           | -9  | 5   |                                                |     | 4   | 4   | 3              |
| 180                | 250 | 0           | -10 | 5   |                                                |     | 5   | 5   | 4              |
| 250                | 315 | 0           | -12 | 6   |                                                |     | 6   | 6   | 4              |
| 315                | 400 | 0           | -14 | 7   |                                                |     | 8   | 7   | 5              |
| 400                | 500 | 0           | -23 | 12  |                                                |     | 10  | 8   | -              |

## Angular contact ball bearing

### 1. Structural characteristics

ZWZ produces standard angular contact ball bearing with three kinds of angles: 15° (name suffix is C), 25° (name suffix is AC), 40° (name suffix is B). The bearing with bigger contact angle recommended for application scenarios like high axial rigidity and high axial load carrying capacity. According to different working conditions, ZWZ also can design and produce angular contact ball bearing with special angles.

According to different requirements of installation control, ZWZ' s precision angular contact ball bearing has different bearing series like 70, 72, 719 and etc. In high speed or minimum radial clearance conditions, it's better to choose 719 or 70 series bearing. For the heavy load and medium speed conditions, 72 series bearing is suitable. 719 series bearing fits to the conditions where stiffness requirements are extremely important, because it has many rolling elements and fits to large diameter main shaft, all of these factors help to make main shaft system have high rigidity. In view of the high speed trend of main shaft, ZWZ has specially researched and developed HA series high speed angular contact ball bearing to adapt high speed main shaft conditions.

### 2. Pre -tighten of bearing

During working and under the running condition, the bearings usually have proper internal clearance.

In order to improve the rigidity or ruing accuracy of bearing

under different working conditions, the bearing is preloaded to make it with certain negative internal clearance,taking some measures to generate certain predeformation among rolling elements, inner ring and outer ring to keep the condition of being pressed between inner ring and outer ring. This process measure is called pre-tighten.

The purpose of pre -tighten

To improve the axial and radial positioning accuracy of shaft and reduce the run-out of shaft.

To improve the rigidity of bearing

To avoid the bearing noise generated by vibration and resonance vibration

To keep correct relative position among rolling elements and rings.

Forms of pre -tighten

Radial or axial pretension can be adopted according to different bearing type. The pretension is realized by applying preload on bearing and make inner ring and outer ring have relative displacement.

### Positioning pre -tighten

In order to fix the relative axial position of bearing and improve the rigidity of bearing

### Constant pressure pre -tighten

The pre-tighten is realized by a spring. Therefore, pre-pressure can be kept steadily even though the position

# Rolling Bearings

between bearings may change due to temperature rise or load during operation.

Single-row angular contact ball bearing: Generally, they're applied axial pre-tighten and used with the other bearing of the same type in face-to-face arrangement or back-to-back arrangement.

Normally, pre-tighten is adjusted under certain ambient temperature during mounting. (or preset according to this temperature ). During operating, if the temperature rise of shaft is greater than bearing block, the preload will be increased. And the preload amount of face-to-face arrangement increases greater than the preload amount of back-to-back arrangement.

## 3. The preload of bearing

The form of preload

In order to meet customers' different demand in speed, heat dissipation and rigidity, ZWZ produces three kinds of national standard preload matched stock precision angular contact ball bearing, the grades are:

Grade A: light preload

Grade B: medium preload

Grade C: heavy preload

In addition, ZWZ can design special group preloaded angular contact ball bearings based on the different working conditions.

## The factors effect to preload

In static and dynamic conditions, the preload in bearing system is affected by some factors. The actual preload installed on bearing in system is different from the scheduled preload in production process. It is depending upon :

Table 15

| Bearing configuration                         | Preload |      |      |
|-----------------------------------------------|---------|------|------|
|                                               | A       | B    | C    |
| Double tandem pairing (DT)                    | 0.9     | 0.8  | 0.65 |
| Back-to-back, face-to-face dual pairs matched | 0.8     | 0.7  | 0.55 |
| Three pairs matched                           | 0.7     | 0.55 | 0.35 |
| Quad pairs matched                            | 0.65    | 0.45 | 0.25 |

1. The actual cooperation between bearing's inner ring with axle and the actual cooperation between bearing' s outer ring with bearing housing;
2. system speed of fixed position;
3. the operation temperature of inside ring, outside ring and rolling elements of bearing;
4. the material of axle and bearing housing (different material had different thermal expansion coefficient, so the deformation of cooperating part is different when the system operating.
5. Geometric error(such as forced not alignment and front and back bearing pedestal in the same axle error)

## 4. Rated speed

The limit speeds given in bearing table are effective when the bearing is running under prescribed national standard lubrication and well heat transmission conditions. When bearing combined with double, triple or four pairs, and one of them working in different preload conditions, we should multiply a required reduce coefficient on the base of the given limit speed. Coefficients are as following:

## 5. Tolerance

Tolerance Class 5 (table 16、 table 17)

Table 16 Inner Ring Tolerance Class 5

μm

| d<br>mm            |     | $\Delta d_{mp}$ |     | V <sub>dp</sub> |               | V <sub>dmp</sub> | K <sub>ia</sub> | S <sub>d</sub> | S <sub>ia</sub> <sup>3)</sup> | $\Delta B_s$ |        |            | V <sub>Bs</sub> |
|--------------------|-----|-----------------|-----|-----------------|---------------|------------------|-----------------|----------------|-------------------------------|--------------|--------|------------|-----------------|
|                    |     |                 |     | Diameter series |               |                  |                 |                |                               | Total        | Normal | Correction |                 |
|                    |     |                 |     | 9               | 0, 1, 2, 3, 4 |                  |                 |                |                               |              |        |            |                 |
| Over               | To  | High            | Low | max             |               | max              | max             | max            | Max                           | High         | Low    |            | max             |
| 0.61 <sup>1)</sup> | 2.5 | 0               | -5  | 5               | 4             | 3                | 4               | 7              | 0                             | -40          | -40    | -250       | 5               |
| 2.5                | 10  | 0               | -5  | 5               | 4             | 3                | 4               | 7              | 0                             | -40          | -40    | -250       | 5               |
| 10                 | 18  | 0               | -5  | 5               | 4             | 3                | 4               | 7              | 0                             | -80          | -80    | -250       | 5               |
| 18                 | 30  | 0               | -6  | 6               | 5             | 3                | 4               | 8              | 0                             | -120         | -120   | -250       | 5               |
| 30                 | 50  | 0               | -8  | 8               | 6             | 4                | 5               | 8              | 0                             | -120         | -120   | -250       | 5               |
| 50                 | 80  | 0               | -9  | 9               | 7             | 5                | 5               | 8              | 0                             | -150         | -150   | -250       | 6               |
| 80                 | 120 | 0               | -10 | 10              | 8             | 5                | 6               | 9              | 0                             | -200         | -200   | -380       | 7               |
| 120                | 180 | 0               | -13 | 13              | 10            | 7                | 8               | 10             | 0                             | -250         | -250   | -380       | 8               |
| 180                | 250 | 0               | -15 | 15              | 12            | 8                | 10              | 11             | 0                             | -300         | -300   | -500       | 10              |
| 250                | 315 | 0               | -18 | 18              | 14            | 9                | 13              | 13             | 0                             | -350         | -350   | -500       | 13              |
| 315                | 400 | 0               | -23 | 23              | 18            | 12               | 15              | 15             | 0                             | -400         | -400   | -630       | 15              |

Notes: 1) Including 0 and 6.

2) Diameter series 7 and 8 have no specified value.

3) Only applicable to groove ball bearing.

4) Refers to installing in pair or in group, the inside ring width deviation of single bearing .

Table 17 Outer Ring Tolerance Class 5

μm

| D<br>mm           |     | $\Delta D_{mp}$ |     | $V_{Dp}^{(2)3)}$ |           | $V_{Dmp}$ | $K_{ea}$ | $S_D$ | $S_{D1}^{(5)}$ | $S_{ea}^{(4)}$ | $S_{ea1}^{(6)}$                                                    | $\Delta C_s$<br>$\Delta C_{1s}^{(5)}$ |     | $V_{Cs}$<br>$V_{C1s}^{(5)}$ |
|-------------------|-----|-----------------|-----|------------------|-----------|-----------|----------|-------|----------------|----------------|--------------------------------------------------------------------|---------------------------------------|-----|-----------------------------|
|                   |     |                 |     | Diameter series  |           |           |          |       |                |                |                                                                    | High                                  | Low | max                         |
|                   |     |                 |     | 9                | 0、1、2、3、4 |           |          |       |                |                |                                                                    |                                       |     |                             |
| Over              | To  | High            | Low | max              |           | max       | max      | max   | max            | max            | max                                                                | High                                  | Low | max                         |
| 2.5 <sup>1)</sup> | 6   | 0               | -5  | 5                | 4         | 3         | 5        | 8     | 8              | 11             | Equal to the<br>$\Delta B_s$ of the<br>same bearing<br>inside ring |                                       |     | 5                           |
| 16                | 18  | 0               | -5  | 5                | 4         | 3         | 5        | 8     | 8              | 11             |                                                                    |                                       |     | 5                           |
| 18                | 30  | 0               | -6  | 6                | 5         | 3         | 6        | 8     | 8              | 11             |                                                                    |                                       |     | 5                           |
| 30                | 50  | 0               | -7  | 7                | 5         | 4         | 7        | 8     | 8              | 11             |                                                                    |                                       |     | 5                           |
| 50                | 80  | 0               | -9  | 9                | 7         | 5         | 8        | 8     | 10             | 14             |                                                                    |                                       |     | 6                           |
| 80                | 120 | 0               | -10 | 10               | 8         | 5         | 10       | 9     | 11             | 16             |                                                                    |                                       |     | 8                           |
| 120               | 150 | 0               | -11 | 11               | 8         | 6         | 11       | 10    | 13             | 18             |                                                                    |                                       |     | 8                           |
| 150               | 180 | 0               | -13 | 13               | 10        | 7         | 13       | 10    | 14             | 20             |                                                                    |                                       |     | 8                           |
| 180               | 250 | 0               | -15 | 15               | 11        | 8         | 15       | 11    | 15             | 21             |                                                                    |                                       |     | 10                          |
| 250               | 315 | 0               | -18 | 18               | 14        | 9         | 18       | 13    | 18             | 25             |                                                                    |                                       |     | 11                          |
| 315               | 400 | 0               | -20 | 20               | 15        | 10        | 20       | 13    | 20             | 28             |                                                                    |                                       |     | 13                          |
| 400               | 500 | 0               | -23 | 23               | 17        | 12        | 23       | 15    | 23             | 33             |                                                                    |                                       |     | 15                          |
| 500               | 630 | 0               | -28 | 28               | 21        | 14        | 25       | 18    | 25             | 35             |                                                                    |                                       |     | 18                          |
| 630               | 800 | 0               | -35 | 35               | 26        | 18        | 30       | 20    | 30             | 42             |                                                                    |                                       |     | 20                          |

Notes: 1) Including 2 and 5

2) Diameter series 7 and 8 have no specified value.

3) Closed type bearing has no specified value.

4) Unapplicable to flanged outer ring bearing.

5) Only applicable to groove ball bearing.

# Rolling Bearings

## Tolerance Class 4 (table 18、table 19)

Table 18 Inner Ring Tolerance Class 4

μm

| d<br>mm            |     | Δd <sub>mp</sub> |     | Δd <sub>s</sub> <sup>2)</sup> |     | V <sub>dp</sub> |               | V <sub>cmp</sub> | K <sub>ia</sub> | S <sub>cl</sub> | S <sub>ia</sub> <sup>4)</sup> | ΔB <sub>s</sub> |        |                          | V <sub>as</sub> |
|--------------------|-----|------------------|-----|-------------------------------|-----|-----------------|---------------|------------------|-----------------|-----------------|-------------------------------|-----------------|--------|--------------------------|-----------------|
|                    |     |                  |     |                               |     | Diameter series |               |                  |                 |                 |                               | Total           | Normal | Correction <sup>5)</sup> |                 |
|                    |     |                  |     |                               |     | 9               | 0, 1, 2, 3, 4 |                  |                 |                 |                               |                 |        |                          |                 |
| Over               | To  | High             | Low | High                          | Low | max             |               | max              | max             | max             | max                           | High            | Low    |                          | max             |
| 0.61 <sup>1)</sup> | 2.5 | 0                | -4  | 0                             | -4  | 4               | 3             | 2                | 2.5             | 3               | 3                             | 0               | -40    | -250                     | 2.5             |
| 2.5                | 10  | 0                | -4  | 0                             | -4  | 4               | 3             | 2                | 2.5             | 3               | 3                             | 0               | -40    | -250                     | 2.5             |
| 10                 | 18  | 0                | -4  | 0                             | -4  | 4               | 3             | 2                | 2.5             | 3               | 3                             | 0               | -80    | -250                     | 2.5             |
| 18                 | 30  | 0                | -5  | 0                             | -5  | 5               | 4             | 2.5              | 3               | 4               | 4                             | 0               | -120   | -250                     | 2.5             |
| 30                 | 50  | 0                | -6  | 0                             | -6  | 6               | 5             | 3                | 4               | 4               | 4                             | 0               | -120   | -250                     | 3               |
| 50                 | 80  | 0                | -7  | 0                             | -7  | 7               | 5             | 3.5              | 4               | 5               | 5                             | 0               | -150   | -250                     | 4               |
| 80                 | 120 | 0                | -8  | 0                             | -8  | 8               | 6             | 4                | 5               | 5               | 5                             | 0               | -200   | -380                     | 4               |
| 120                | 180 | 0                | -10 | 0                             | -10 | 10              | 8             | 5                | 6               | 6               | 7                             | 0               | -250   | -380                     | 5               |
| 180                | 250 | 0                | -12 | 0                             | -12 | 12              | 9             | 6                | 8               | 7               | 8                             | 0               | -300   | -500                     | 6               |

Notes: 1) Including 0 and 6

2) Only applicable to diameter series 0, 1, 2, 3 and 4.

3) Diameter series 7 and 8 have no specified value.

4) Only applicable to groove ball bearing.

5) Refers to installing in pair or in group, the inside ring width deviation of single bearing.

Table 19 Outer Ring Tolerance Class 4

μm

| D<br>mm            |       | $\Delta D_{mp}$    |                    | $\Delta D_{s^{(2)}}$ |                    | V <sub>Dp</sub> <sup>(3,4)</sup> |               | V <sub>Dmp</sub> | K <sub>ea</sub> | S <sub>D</sub> <sup>(5)</sup><br>S <sub>D1</sub> <sup>(6)</sup> | S <sub>ea</sub> <sup>(5)</sup> | S <sub>ea1</sub> <sup>(6)</sup> | $\frac{\Delta C_s}{\Delta C_{1s^{(6)}}}$                  |                    | V <sub>Cs</sub><br>V <sub>C1s</sub> <sup>(5)</sup> |     |
|--------------------|-------|--------------------|--------------------|----------------------|--------------------|----------------------------------|---------------|------------------|-----------------|-----------------------------------------------------------------|--------------------------------|---------------------------------|-----------------------------------------------------------|--------------------|----------------------------------------------------|-----|
|                    |       |                    |                    |                      |                    | Diameter series                  |               |                  |                 |                                                                 |                                |                                 |                                                           |                    |                                                    |     |
|                    |       |                    |                    |                      |                    | 9                                | 0, 1, 2, 3, 4 |                  |                 |                                                                 |                                |                                 |                                                           |                    |                                                    |     |
| Exceed             | Reach | Upper<br>deviation | Lower<br>deviation | Upper<br>deviation   | Lower<br>deviation | max                              |               | max              | max             | max                                                             | max                            | max                             | max                                                       | Upper<br>deviation | Lower<br>deviation                                 | max |
| 2.51 <sup>1)</sup> | 6     | 0                  | -4                 | -4                   | -4                 | 4                                | 3             | 2                | 3               | 4                                                               | 5                              | 7                               | Equal to the<br>ΔBs of the<br>same bearing<br>inside ring |                    |                                                    | 2.5 |
| 6                  | 18    | 0                  | -4                 | -4                   | -4                 | 4                                | 3             | 2                | 3               | 4                                                               | 5                              | 7                               |                                                           |                    |                                                    | 2.5 |
| 18                 | 30    | 0                  | -5                 | -5                   | -5                 | 5                                | 4             | 2.5              | 4               | 4                                                               | 5                              | 7                               |                                                           |                    |                                                    | 2.5 |
| 30                 | 50    | 0                  | -6                 | -6                   | -6                 | 6                                | 5             | 3                | 5               | 4                                                               | 5                              | 7                               |                                                           |                    |                                                    | 2.5 |
| 50                 | 80    | 0                  | -7                 | -7                   | -7                 | 7                                | 5             | 3.5              | 5               | 4                                                               | 5                              | 7                               |                                                           |                    |                                                    | 3   |
| 80                 | 120   | 0                  | -8                 | -8                   | -8                 | 8                                | 6             | 4                | 6               | 5                                                               | 6                              | 8                               |                                                           |                    |                                                    | 4   |
| 120                | 150   | 0                  | -9                 | -9                   | -9                 | 9                                | 7             | 5                | 7               | 5                                                               | 7                              | 10                              |                                                           |                    |                                                    | 5   |
| 150                | 180   | 0                  | -10                | -10                  | -10                | 10                               | 8             | 5                | 8               | 5                                                               | 8                              | 11                              |                                                           |                    |                                                    | 5   |
| 180                | 250   | 0                  | -11                | -11                  | -11                | 11                               | 8             | 6                | 10              | 7                                                               | 10                             | 14                              |                                                           |                    |                                                    | 7   |
| 250                | 315   | 0                  | -13                | -13                  | -13                | 13                               | 10            | 7                | 11              | 8                                                               | 10                             | 14                              |                                                           |                    |                                                    | 7   |
| 315                | 400   | 0                  | -15                | -15                  | -15                | 15                               | 11            | 8                | 13              | 10                                                              | 13                             | 18                              |                                                           |                    | 8                                                  |     |

Notes: Outside ring flange outside diameter D1 tolerance prescribed in article 19 of 5.3.

4) Including 2.5

5) Only applicable to diameter series 0, 1, 2, 3 and 4.

6) Diameter series 7 and 8 have no specified value.

7) Closed type bearing has no specified value.

8) Unapplicable to flanged outer ring bearing

9) Only applicable to groove ball bearing.

## Class 2 tolerance (table 20、table 21)

Table 20 Inner Ring Tolerance Class 2

μm

| d<br>mm           |     | Δd <sub>mp</sub> |      | Δd <sub>s</sub> |      | V <sub>dp<sup>2)</sup></sub> | V <sub>dmp</sub> | K <sub>ia</sub> | S <sub>d</sub> | S <sub>ia<sup>3)</sup></sub> | ΔB <sub>s</sub> |        |                          | V <sub>bs</sub> |
|-------------------|-----|------------------|------|-----------------|------|------------------------------|------------------|-----------------|----------------|------------------------------|-----------------|--------|--------------------------|-----------------|
|                   |     |                  |      |                 |      |                              |                  |                 |                |                              | Total           | Normal | Correction <sup>5)</sup> |                 |
| Over              | To  | High             | Low  | High            | Low  | max                          | max              | max             | max            | max                          | High            | Low    |                          | max             |
| 0.6 <sup>1)</sup> | 2.5 | 0                | -2.5 | 0               | -2.5 | 2.5                          | 1.5              | 1.5             | 1.5            | 1.5                          | 0               | -40    | -250                     | 1.5             |
| 2.5               | 10  | 0                | -2.5 | 0               | -2.5 | 2.5                          | 1.5              | 1.5             | 1.5            | 1.5                          | 0               | -40    | -250                     | 1.5             |
| 10                | 18  | 0                | -2.5 | 0               | -2.5 | 2.5                          | 1.5              | 1.5             | 1.5            | 1.5                          | 0               | -80    | -250                     | 1.5             |
| 18                | 30  | 0                | -2.5 | 0               | -2.5 | 2.5                          | 1.5              | 2.5             | 1.5            | 2.5                          | 0               | -120   | -250                     | 1.5             |
| 30                | 50  | 0                | -2.5 | 0               | -2.5 | 2.5                          | 1.5              | 2.5             | 1.5            | 2.5                          | 0               | -120   | -250                     | 1.5             |
| 50                | 80  | 0                | -4   | 0               | -4   | 4                            | 2                | 2.5             | 1.5            | 2.5                          | 0               | -150   | -250                     | 1.5             |
| 80                | 120 | 0                | -5   | 0               | -5   | 5                            | 2.5              | 2.5             | 2.5            | 2.5                          | 0               | -200   | -380                     | 2.5             |
| 120               | 150 | 0                | -7   | 0               | -7   | 7                            | 3.5              | 2.5             | 2.5            | 2.5                          | 0               | -250   | -380                     | 2.5             |
| 150               | 180 | 0                | -7   | 0               | -7   | 7                            | 3.5              | 5               | 4              | 5                            | 0               | -250   | -380                     | 4               |
| 180               | 250 | 0                | -8   | 0               | -8   | 8                            | 4                | 5               | 5              | 5                            | 0               | -300   | -500                     | 5               |

Notes : 1) Including 0 and 6.

2) not apply diameter series 7, 8 and 9.

3) Only applicable to groove ball bearing.

4) Refers to installing in pair or in group, the inside ring width deviation of single bearing.

Table 21 Outer Ring Tolerance Class 2

μm

| D<br>mm |     | ΔD <sub>mp</sub> |      | ΔD <sub>s</sub> <sup>2)</sup> |      | V <sub>Dp</sub> <sup>2)</sup> | V <sub>Dmp</sub> | K <sub>ea</sub> | S <sub>D</sub> <sup>3)</sup><br>S <sub>D1</sub> <sup>4)</sup> | S <sub>ea</sub> <sup>3)4)</sup> | S <sub>ea1</sub> <sup>4)</sup> | ΔC <sub>s</sub><br>ΔC <sub>1s</sub> <sup>4)</sup>      |     | V <sub>Cs</sub><br>V <sub>C1s</sub> <sup>4)</sup> |
|---------|-----|------------------|------|-------------------------------|------|-------------------------------|------------------|-----------------|---------------------------------------------------------------|---------------------------------|--------------------------------|--------------------------------------------------------|-----|---------------------------------------------------|
| Over    | To  | High             | Low  | High                          | Low  | max                           | max              | max             | max                                                           | max                             | max                            | High                                                   | Low | max                                               |
| 2.51*   | 6   | 0                | -2.5 | 0                             | -2.5 | 2.5                           | 1.5              | 1.5             | 1.5                                                           | 1.5                             | 3                              | Equal to the<br>ΔBs of the same<br>bearing inside ring |     | 1.5                                               |
| 6       | 18  | 0                | -2.5 | 0                             | -2.5 | 2.5                           | 1.5              | 1.5             | 1.5                                                           | 1.5                             | 3                              |                                                        |     | 1.5                                               |
| 18      | 30  | 0                | -4   | 0                             | -4   | 4                             | 2                | 2.5             | 1.5                                                           | 2.5                             | 4                              |                                                        |     | 1.5                                               |
| 30      | 50  | 0                | -4   | 0                             | -4   | 4                             | 2                | 2.5             | 1.5                                                           | 2.5                             | 4                              |                                                        |     | 1.5                                               |
| 50      | 80  | 0                | -4   | 0                             | -4   | 4                             | 2                | 4               | 1.5                                                           | 4                               | 6                              |                                                        |     | 1.5                                               |
| 80      | 120 | 0                | -5   | 0                             | -5   | 5                             | 2.5              | 5               | 2.5                                                           | 5                               | 7                              |                                                        |     | 2.5                                               |
| 120     | 150 | 0                | -5   | 0                             | -5   | 5                             | 2.5              | 5               | 2.5                                                           | 5                               | 7                              |                                                        |     | 2.5                                               |
| 150     | 180 | 0                | -7   | 0                             | -7   | 7                             | 3.5              | 5               | 2.5                                                           | 5                               | 7                              |                                                        |     | 2.5                                               |
| 180     | 250 | 0                | -8   | 0                             | -8   | 8                             | 4                | 7               | 4                                                             | 7                               | 10                             |                                                        |     | 4                                                 |
| 250     | 315 | 0                | -8   | 0                             | -8   | 8                             | 4                | 7               | 5                                                             | 7                               | 10                             |                                                        |     | 5                                                 |
| 315     | 400 | 0                | -10  | 0                             | -10  | 10                            | 5                | 8               | 7                                                             | 8                               | 11                             |                                                        | 7   |                                                   |

Notes : outside ring flange diameter D1 tolerance prescribed in article 19 of 5.3.

1) Including 2.5.

2) Applicable to diameter series 0,1,2,3 and 4 of the open type and closed type bearing.

3) unapplicable to flanged outer ring bearing.

4) Only applicable to groove ball bearing.

## Taper roller bearings

### 1. structural characteristics

while the tapered roller bearing designing, the sliding surfaces of cup, inner ring and the rolling elements will converge towards the same single point on the bearing axes. Therefore, the roller will archive pure rolling motion on the raceway.

Tapered roller bearing can bear combined load of radial and axial. The axial load capacity of bearing varies with contact angle. The greater contact angle is, the bigger axial load capacity is. Even under the circumstance bearing only

bears radial load, the axial separate will also appears, generally, double sets of tapered roller bearings arrangement is recommended.

### 2. Internal clearance

Single row tapered roller bearings have clearance only after they are mounted, and the clearance can be determined only when another bearing is located next to it in the opposite direction after adjusting. The radial clearance of double row tapered roller bearing are listed in the table below:

Table 22  $\mu\text{m}$

| Nominal bore Dia<br>d mm |      | C1  |     | C2  |     | Normal(CN) |     | C3  |     | C4  |      | C5   |      |
|--------------------------|------|-----|-----|-----|-----|------------|-----|-----|-----|-----|------|------|------|
| Over                     | To   | min | max | min | max | min        | max | min | max | min | max  | min  | max  |
| 30                       | 30   | 0   | 10  | 10  | 20  | 20         | 30  | 40  | 50  | 50  | 60   | 70   | 80   |
| 30                       | 40   | 0   | 12  | 12  | 25  | 25         | 40  | 45  | 60  | 60  | 75   | 80   | 95   |
| 40                       | 50   | 0   | 15  | 15  | 30  | 30         | 45  | 50  | 65  | 65  | 80   | 90   | 110  |
| 50                       | 65   | 0   | 15  | 15  | 30  | 30         | 50  | 50  | 70  | 70  | 90   | 90   | 120  |
| 65                       | 80   | 0   | 20  | 20  | 40  | 40         | 60  | 60  | 80  | 80  | 110  | 110  | 150  |
| 80                       | 100  | 0   | 20  | 20  | 45  | 45         | 70  | 70  | 100 | 100 | 130  | 130  | 170  |
| 100                      | 120  | 0   | 25  | 25  | 50  | 50         | 80  | 80  | 110 | 110 | 150  | 150  | 200  |
| 120                      | 140  | 0   | 30  | 30  | 60  | 60         | 90  | 90  | 120 | 120 | 170  | 170  | 230  |
| 140                      | 160  | 0   | 30  | 30  | 6   | 65         | 100 | 100 | 140 | 140 | 190  | 190  | 260  |
| 160                      | 180  | 0   | 35  | 35  | 70  | 70         | 110 | 110 | 150 | 150 | 210  | 210  | 280  |
| 180                      | 200  | 0   | 40  | 40  | 80  | 80         | 120 | 120 | 170 | 170 | 230  | 230  | 310  |
| 200                      | 225  | 0   | 40  | 40  | 90  | 90         | 140 | 140 | 190 | 190 | 260  | 260  | 340  |
| 225                      | 250  | 0   | 50  | 50  | 100 | 100        | 150 | 150 | 210 | 210 | 290  | 290  | 380  |
| 250                      | 280  | 0   | 50  | 50  | 110 | 110        | 170 | 170 | 230 | 230 | 320  | 320  | 420  |
| 280                      | 315  | 0   | 60  | 60  | 120 | 120        | 180 | 180 | 250 | 250 | 350  | 350  | 460  |
| 315                      | 355  | 0   | 70  | 70  | 140 | 140        | 210 | 210 | 280 | 280 | 390  | 390  | 510  |
| 355                      | 400  | 0   | 70  | 70  | 150 | 150        | 230 | 230 | 310 | 310 | 440  | 440  | 580  |
| 400                      | 450  | 0   | 80  | 80  | 170 | 170        | 260 | 260 | 350 | 350 | 490  | 490  | 650  |
| 450                      | 500  | 0   | 90  | 90  | 190 | 190        | 290 | 290 | 390 | 390 | 540  | 540  | 720  |
| 500                      | 560  | 0   | 100 | 100 | 210 | 210        | 320 | 320 | 430 | 430 | 590  | 590  | 790  |
| 560                      | 630  | 0   | 110 | 110 | 230 | 230        | 350 | 350 | 480 | 480 | 660  | 660  | 880  |
| 630                      | 710  | 0   | 130 | 130 | 260 | 260        | 400 | 400 | 540 | 540 | 740  | 740  | 910  |
| 710                      | 800  | 0   | 140 | 140 | 290 | 290        | 450 | 450 | 610 | 610 | 830  | 830  | 1100 |
| 800                      | 900  | 0   | 160 | 160 | 330 | 330        | 500 | 500 | 670 | 670 | 920  | 920  | 1240 |
| 900                      | 1000 | 0   | 180 | 180 | 360 | 360        | 540 | 540 | 720 | 720 | 980  | 980  | 1300 |
| 1000                     | 1120 | 0   | 200 | 200 | 400 | 400        | 600 | 600 | 820 | 820 | 1100 | 1100 | 1440 |
| 1120                     | 1250 | 0   | 220 | 220 | 450 | 450        | 670 | 670 | 900 | 900 | 1240 | 1240 | 1600 |
| 1250                     | 1400 | 0   | 250 | 250 | 500 | 500        | 750 | 750 | 980 | 980 | 1300 | 1300 | 1700 |

### 3. Tolerance

P0 tolerance (Table 23, Table 24, Table 25)

Table 23 Inner ring Diameter Tolerance and Runout Tolerance  $\mu\text{m}$

| d mm |     | $\Delta d_{mp}$ |     | $V_{dp}$ | $V_{dmp}$ | Kia |
|------|-----|-----------------|-----|----------|-----------|-----|
| Over | To  | High            | Low | max      | max       | max |
| 10   | 18  | 0               | -12 | 12       | 9         | 15  |
| 18   | 30  | 0               | -12 | 12       | 9         | 18  |
| 30   | 50  | 0               | -12 | 12       | 9         | 20  |
| 50   | 80  | 0               | -15 | 15       | 11        | 25  |
| 80   | 120 | 0               | -20 | 20       | 15        | 30  |
| 120  | 180 | 0               | -25 | 25       | 19        | 35  |
| 180  | 250 | 0               | -30 | 30       | 23        | 50  |
| 250  | 315 | 0               | -35 | 35       | 26        | 60  |
| 315  | 400 | 0               | -40 | 40       | 30        | 70  |

Table 24 Outer ring Diameter Tolerance and Runout Tolerance  $\mu\text{m}$

| D mm |     | $\Delta D_{mp}$ |     | $V_{Dp}$ | $V_{Dmp}$ | Kea |
|------|-----|-----------------|-----|----------|-----------|-----|
| Over | To  | High            | Low | max      | max       | max |
| 18   | 30  | 0               | -12 | 12       | 9         | 18  |
| 30   | 50  | 0               | -14 | 14       | 11        | 20  |
| 50   | 80  | 0               | -16 | 16       | 12        | 25  |
| 80   | 120 | 0               | -18 | 18       | 14        | 35  |
| 120  | 150 | 0               | -20 | 20       | 15        | 40  |
| 150  | 180 | 0               | -25 | 25       | 19        | 45  |
| 180  | 250 | 0               | -30 | 30       | 23        | 50  |
| 250  | 315 | 0               | -35 | 35       | 26        | 60  |
| 315  | 400 | 0               | -40 | 40       | 30        | 70  |
| 400  | 500 | 0               | -45 | 45       | 34        | 80  |
| 500  | 630 | 0               | -50 | 50       | 38        | 100 |

Table 25 Width - inner and outer ring, single row bearings and its components  $\mu\text{m}$

| d mm |     | $\Delta B_s$ |      | $\Delta C_s$ |      | $\Delta T_s$ |      | $\Delta T_{1s}$ |      | $\Delta T_{2s}$ |      |
|------|-----|--------------|------|--------------|------|--------------|------|-----------------|------|-----------------|------|
| Over | To  | High         | Low  | High         | Low  | High         | Low  | High            | Low  | High            | Low  |
| 10   | 18  | 0            | -120 | 0            | -120 | +200         | 0    | +100            | 0    | +100            | 0    |
| 18   | 30  | 0            | -120 | 0            | -120 | +200         | 0    | +100            | 0    | +100            | 0    |
| 30   | 50  | 0            | -120 | 0            | -120 | +200         | 0    | +100            | 0    | +100            | 0    |
| 50   | 80  | 0            | -150 | 0            | -150 | +200         | 0    | +100            | 0    | +100            | 0    |
| 80   | 120 | 0            | -200 | 0            | -200 | +200         | -200 | +100            | -100 | +100            | -100 |
| 120  | 180 | 0            | -250 | 0            | -250 | +350         | -250 | +150            | -150 | +200            | -100 |
| 180  | 250 | 0            | -300 | 0            | -300 | +350         | -250 | +150            | -150 | +200            | -100 |
| 250  | 315 | 0            | -350 | 0            | -350 | +350         | -250 | +150            | -150 | +200            | -100 |
| 315  | 400 | 0            | -400 | 0            | -400 | +400         | -400 | +200            | -200 | +200            | -200 |

### P6X tolerance

The inner and outer diameter and runout tolerance of the tolerance level is the same as the specified values of P0 tolerance in Table 13 and Table 14. The width tolerance specifications is in Table 16

Table 26 Width-the inner and outer ring, single row bearings and its components  $\mu\text{m}$

| d mm |     | $\Delta B_s$ |     | $\Delta C_s$ |      | $\Delta T_s$ |     | $\Delta T_{1s}$ |     | $\Delta T_{2s}$ |     |
|------|-----|--------------|-----|--------------|------|--------------|-----|-----------------|-----|-----------------|-----|
| Over | To  | High         | Low | High         | Low  | High         | Low | High            | Low | High            | Low |
| 10   | 18  | 0            | -50 | 0            | -100 | +100         | 0   | +50             | 0   | +50             | 0   |
| 18   | 30  | 0            | -50 | 0            | -100 | +100         | 0   | +50             | 0   | +50             | 0   |
| 30   | 50  | 0            | -50 | 0            | -100 | +100         | 0   | +50             | 0   | +50             | 0   |
| 50   | 80  | 0            | -50 | 0            | -100 | +100         | 0   | +50             | 0   | +50             | 0   |
| 80   | 120 | 0            | -50 | 0            | -100 | +100         | 0   | +50             | 0   | +50             | 0   |
| 120  | 180 | 0            | -50 | 0            | -100 | +150         | 0   | +50             | 0   | +100            | 0   |
| 180  | 250 | 0            | -50 | 0            | -100 | +150         | 0   | +50             | 0   | +100            | 0   |
| 250  | 315 | 0            | -50 | 0            | -100 | +200         | 0   | +100            | 0   | +100            | 0   |
| 315  | 400 | 0            | -50 | 0            | -100 | +200         | 0   | +100            | 0   | +100            | 0   |

# Rolling Bearings

P5 Tolerance (Table 27、Table 28)

Table 27 The width of the inner ring and single row bearings

μm

| d mm |     | $\Delta_{dmp}$ |     | $V_{dp}$ | $V_{dmp}$ | $K_{ia}$ | $S_d$ | $\Delta_{Bs}$ |      | $\Delta T_s$ |      |
|------|-----|----------------|-----|----------|-----------|----------|-------|---------------|------|--------------|------|
| Over | To  | High           | Low | max      | max       | max      | max   | High          | Low  | High         | Low  |
| 10   | 18  | 0              | -7  | 5        | 5         | 5        | 7     | 0             | -200 | +200         | -200 |
| 18   | 30  | 0              | -8  | 6        | 5         | 5        | 8     | 0             | -200 | +200         | -200 |
| 30   | 50  | 0              | -10 | 8        | 5         | 6        | 8     | 0             | -240 | +200         | -200 |
| 50   | 80  | 0              | -12 | 9        | 6         | 7        | 8     | 0             | -300 | +200         | -200 |
| 80   | 120 | 0              | -15 | 11       | 8         | 8        | 9     | 0             | -400 | +200         | -200 |
| 120  | 180 | 0              | -18 | 14       | 9         | 11       | 10    | 0             | -500 | +350         | -250 |
| 180  | 250 | 0              | -22 | 17       | 11        | 13       | 11    | 0             | -600 | +350         | -250 |

Table 28 The outer ring

μm

| D mm |     | $\Delta_{Dmp}$ |     | $V_{Dp}$ | $V_{Dmp}$ | $K_{ea}$ | $S_{D1}$ $S_{D1}$ | $\Delta C_s$                                            |     |
|------|-----|----------------|-----|----------|-----------|----------|-------------------|---------------------------------------------------------|-----|
| Over | To  | High           | Low | max      | max       | max      | max               | High                                                    | Low |
| 18   | 30  | 0              | -8  | 6        | 5         | 6        | 8                 | The same as the same bearing inner ring's $\Delta_{Bs}$ |     |
| 30   | 50  | 0              | -9  | 7        | 5         | 7        | 8                 |                                                         |     |
| 50   | 80  | 0              | -11 | 8        | 6         | 8        | 8                 |                                                         |     |
| 80   | 120 | 0              | -13 | 10       | 7         | 10       | 9                 |                                                         |     |
| 120  | 150 | 0              | -15 | 11       | 8         | 11       | 10                |                                                         |     |
| 150  | 180 | 0              | -18 | 14       | 9         | 13       | 10                |                                                         |     |
| 180  | 250 | 0              | -20 | 15       | 10        | 15       | 11                |                                                         |     |
| 250  | 315 | 0              | -25 | 19       | 13        | 18       | 13                |                                                         |     |
| 315  | 400 | 0              | -28 | 22       | 14        | 20       | 13                |                                                         |     |

1) Not suitable for flanged outer bearings

P4 Tolerance (Table 29、Table 30)

Table 29 The width of the inner ring and single row bearings

μm

| d mm |     | $\Delta_{dmp}$ |     | $\Delta d_s$ |     | $V_{dp}$ | $V_{dmp}$ | $K_{ia}$ | $S_d$ | $S_{ia}$ | $\Delta_{Bs}$ |      | $\Delta T_s$ |      |
|------|-----|----------------|-----|--------------|-----|----------|-----------|----------|-------|----------|---------------|------|--------------|------|
| Over | To  | High           | Low | High         | Low | max      | max       | max      | max   | max      | High          | Low  | High         | Low  |
| 10   | 18  | 0              | -5  | 0            | -5  | 4        | 4         | 3        | 3     | 3        | 0             | -200 | +200         | -200 |
| 18   | 30  | 0              | -6  | 0            | -6  | 5        | 4         | 3        | 4     | 4        | 0             | -200 | +200         | -200 |
| 30   | 50  | 0              | -8  | 0            | -8  | 6        | 5         | 4        | 4     | 4        | 0             | -240 | +200         | -200 |
| 50   | 80  | 0              | -9  | 0            | -9  | 7        | 5         | 4        | 5     | 4        | 0             | -300 | +200         | -200 |
| 80   | 120 | 0              | -10 | 0            | -10 | 8        | 5         | 5        | 5     | 5        | 0             | -400 | +200         | -200 |
| 120  | 180 | 0              | -13 | 0            | -13 | 10       | 7         | 6        | 6     | 7        | 0             | -500 | +350         | -250 |
| 180  | 250 | 0              | -15 | 0            | -15 | 11       | 8         | 8        | 7     | 8        | 0             | -600 | +350         | -250 |

Table 30 Outer ring

μm

| D mm |     | $\Delta_{Dmp}$ |     | $\Delta D_s$ |     | $V_{Dp}$ | $V_{Dmp}$ | $K_{ea}$ | $S_{D1}$ $S_{D1}$ | $S_{ea1}$ | $S_{ea1}^1$ | $\Delta C_s$                                            |     |
|------|-----|----------------|-----|--------------|-----|----------|-----------|----------|-------------------|-----------|-------------|---------------------------------------------------------|-----|
| Over | To  | High           | Low | High         | Low | max      | max       | max      | max               | max       | max         | High                                                    | Low |
| 18   | 30  | 0              | -6  | 0            | -6  | 5        | 4         | 4        | 4                 | 5         | 7           | The same as the same bearing inner ring's $\Delta_{Bs}$ |     |
| 30   | 50  | 0              | -7  | 0            | -7  | 5        | 5         | 5        | 4                 | 5         | 7           |                                                         |     |
| 50   | 80  | 0              | -9  | 0            | -9  | 7        | 5         | 5        | 4                 | 5         | 7           |                                                         |     |
| 80   | 120 | 0              | -10 | 0            | -10 | 8        | 5         | 6        | 5                 | 6         | 8           |                                                         |     |
| 120  | 150 | 0              | -11 | 0            | -11 | 8        | 6         | 7        | 5                 | 7         | 10          |                                                         |     |
| 150  | 180 | 0              | -13 | 0            | -13 | 10       | 7         | 8        | 5                 | 8         | 11          |                                                         |     |
| 180  | 250 | 0              | -15 | 0            | -15 | 11       | 8         | 10       | 7                 | 10        | 14          |                                                         |     |
| 250  | 315 | 0              | -18 | 0            | -18 | 14       | 9         | 11       | 8                 | 10        | 14          |                                                         |     |
| 315  | 400 | 0              | -20 | 0            | -20 | 15       | 10        | 13       | 10                | 13        | 18          |                                                         |     |

Not suitable for flanged outer bearings

## Machine tool screw with thrust angular contact ball bearing

### Structural features

In order to adapt to the conditions required of the machine tool screw, ZWZ has developed thrust angular contact ball bearings specifically for machine tool screw. This type of bearing has 60° contact angle, and featured by more steel balls in order to fulfill the requirement of axial rigidity and low starting torque to the screw bearing.

### Size and Tolerance

ZWZ not only could design and manufacture the 7602XX and 7603XX, two series screw bearings complied with national standards, but ZWZ can also design special dimension bearings base on the customer demand.

ZWZ can provide P4 and P2 tolerance level products for machining screw ball bearings, the tolerance complied the rules for radial ball bearings.

## Thrust Ball Bearings

### 1. Structural features

Single direction thrust ball bearing is the separation type bearing. Composed by a shaft washer, a housing washer and a group of ball and cage. Have the characteristics of convenient installation and remove. The single direction thrust ball bearings can only bear axial force, can not afford any radial loads, can positioning to the single axial direction.



# Rolling Bearings

## 2. Tolerance

Table 31 Tolerance Grade 5 Shaft washer and bearing height

μm

| d and,d2/mm |      | $\Delta_{dmp}, \Delta_{dmp}$ |      | $V_{dp}, V_{d2p}$ | $S_i$ | $\Delta T_s$ |       | $\Delta T_{1s}$ |      |
|-------------|------|------------------------------|------|-------------------|-------|--------------|-------|-----------------|------|
| Over        | To   | High                         | Low  | max               | max   | High         | Low   | High            | Low  |
| 18          | 18   | 0                            | -8   | 6                 | 3     | +20          | -250  | +150            | -400 |
| 30          | 30   | 0                            | -10  | 8                 | 3     | +20          | -250  | +150            | -400 |
| 30          | 50   | 0                            | -12  | 9                 | 3     | +20          | -250  | +150            | -400 |
| 50          | 80   | 0                            | -15  | 11                | 4     | +20          | -300  | +150            | -500 |
| 80          | 120  | 0                            | -20  | 15                | 4     | +25          | -300  | +200            | -500 |
| 120         | 180  | 0                            | -25  | 19                | 5     | +25          | -400  | +200            | -600 |
| 180         | 250  | 0                            | -30  | 23                | 5     | +30          | -400  | +250            | -600 |
| 250         | 315  | 0                            | -35  | 26                | 7     | +40          | -400  |                 |      |
| 315         | 400  | 0                            | -40  | 30                | 7     | +40          | -500  |                 |      |
| 400         | 500  | 0                            | -45  | 34                | 9     | +50          | -500  |                 |      |
| 500         | 630  | 0                            | -50  | 38                | 11    | +60          | -600  |                 |      |
| 630         | 800  | 0                            | -75  | 55                | 13    | +70          | -750  |                 |      |
| 800         | 1000 | 0                            | -100 | 75                | 15    | +80          | -1000 |                 |      |
| 1000        | 1250 | 0                            | -125 | 95                | 18    | +100         | -1400 |                 |      |
| 1250        | 1600 | 0                            | -160 | 120               | 25    | +120         | -1600 |                 |      |
| 1600        | 2000 | 0                            | -200 | 150               | 30    | +140         | -1900 |                 |      |
| 2000        | 2500 | 0                            | -250 | 190               | 40    | +160         | -2300 |                 |      |

Table 32 Tolerance Grade 5 housing washer

μm

| D /mm |     | $\Delta D_{mp}$ |     | $V_{DP}$ | $S_e$                                           |
|-------|-----|-----------------|-----|----------|-------------------------------------------------|
| Over  | To  | High            | Low | max      | max                                             |
| 10    | 18  | 0               | -11 | 8        | Si value is equal to same model of shaft washer |
| 18    | 30  | 0               | -13 | 10       |                                                 |
| 30    | 50  | 0               | -16 | 12       |                                                 |
| 50    | 80  | 0               | -19 | 14       |                                                 |
| 80    | 120 | 0               | -22 | 17       |                                                 |
| 120   | 180 | 0               | -25 | 19       |                                                 |
| 180   | 250 | 0               | -30 | 23       |                                                 |
| 250   | 315 | 0               | -35 | 26       |                                                 |
| 315   | 400 | 0               | -40 | 30       |                                                 |
| 400   | 500 | 0               | -45 | 34       |                                                 |
| 500   | 630 | 0               | -50 | 38       |                                                 |
| 630   | 800 | 0               | -75 | 55       |                                                 |

| D /mm                                                                               |      | $\Delta D_{mp}$ |      | $V_{DP}$ | $S_e$                                           |
|-------------------------------------------------------------------------------------|------|-----------------|------|----------|-------------------------------------------------|
| Over                                                                                | To   | High            | Low  | max      | max                                             |
| 800                                                                                 | 1000 | 0               | -100 | 75       | Si value is equal to same model of shaft washer |
| 1000                                                                                | 1250 | 0               | -125 | 95       |                                                 |
| 1250                                                                                | 1600 | 0               | -160 | 120      |                                                 |
| 1600                                                                                | 2000 | 0               | -200 | 150      |                                                 |
| 2000                                                                                | 2500 | 0               | -250 | 190      |                                                 |
| 2500                                                                                | 2850 | 0               | -300 | 225      |                                                 |
| Note: Double direction bearing tolerance only suitable for bearing $D \leq 360mm$ . |      |                 |      |          |                                                 |

Table 33 Tolerance Grade 4 Shaft washer and bearing height

μm

| d and,d2/mm                                                                   |     | $\Delta_{dmp}, \Delta_{dmp}$ |     | $V_{dp}, V_{d2p}$ | $S_i$ | $\Delta T_s$ |      | $\Delta T_{1s}$ |      |
|-------------------------------------------------------------------------------|-----|------------------------------|-----|-------------------|-------|--------------|------|-----------------|------|
| Over                                                                          | To  | High                         | Low | max               | max   | High         | Low  | High            | Low  |
| 18                                                                            | 18  | 0                            | -7  | 5                 | 2     | +20          | -250 | +150            | -400 |
| 30                                                                            | 30  | 0                            | -8  | 6                 | 2     | +20          | -250 | +150            | -400 |
| 30                                                                            | 50  | 0                            | -10 | 8                 | 2     | +20          | -250 | +150            | -400 |
| 50                                                                            | 80  | 0                            | -12 | 9                 | 3     | +20          | -300 | +150            | -500 |
| 80                                                                            | 120 | 0                            | -15 | 11                | 3     | +25          | -300 | +200            | -500 |
| 120                                                                           | 180 | 0                            | -18 | 14                | 4     | +25          | -400 | +200            | -600 |
| 180                                                                           | 250 | 0                            | -22 | 17                | 4     | +30          | -400 | +250            | -600 |
| 250                                                                           | 315 | 0                            | -25 | 19                | 5     | +40          | -400 |                 |      |
| 315                                                                           | 400 | 0                            | -30 | 23                | 5     | +40          | -500 |                 |      |
| 400                                                                           | 500 | 0                            | -35 | 26                | 6     | +50          | -500 |                 |      |
| 500                                                                           | 630 | 0                            | -40 | 30                | 7     | +60          | -600 |                 |      |
| 630                                                                           | 800 | 0                            | -50 | 40                | 8     | +70          | -750 |                 |      |
| Note: Double direction bearing tolerance only suitable for bearing D ≤ 190mm. |     |                              |     |                   |       |              |      |                 |      |

Table 34 Tolerance Grade 4 housing washer

μm

| D /mm                                                                               |      | $\Delta D_{mp}$ |     | $V_{DP}$ | $S_a$                                           |
|-------------------------------------------------------------------------------------|------|-----------------|-----|----------|-------------------------------------------------|
| Over                                                                                | To   | High            | Low | max      | max                                             |
| 10                                                                                  | 18   | 0               | -7  | 5        | Si value is equal to same model of shaft washer |
| 18                                                                                  | 30   | 0               | -8  | 6        |                                                 |
| 30                                                                                  | 50   | 0               | -9  | 7        |                                                 |
| 50                                                                                  | 80   | 0               | -11 | 8        |                                                 |
| 80                                                                                  | 120  | 0               | -13 | 10       |                                                 |
| 120                                                                                 | 180  | 0               | -15 | 11       |                                                 |
| 180                                                                                 | 250  | 0               | -20 | 15       |                                                 |
| 250                                                                                 | 315  | 0               | -25 | 19       |                                                 |
| 315                                                                                 | 400  | 0               | -28 | 21       |                                                 |
| 400                                                                                 | 500  | 0               | -33 | 25       |                                                 |
| 500                                                                                 | 630  | 0               | -38 | 29       |                                                 |
| 630                                                                                 | 800  | 0               | -45 | 34       |                                                 |
| 800                                                                                 | 1000 | 0               | -60 | 45       |                                                 |
| Note: Double direction bearing tolerance only suitable for bearing $D \leq 360$ mm. |      |                 |     |          |                                                 |

## Double direction thrust angular contact ball bearing

### Structural features

ZWZ mainly provide two series, 2344 and 2349, double direction thrust angular contact ball bearing. With 60° contact angle.

This bearing can positioning at the axial location on the main shaft in both directions. This series bearings usually installed together with same bore and the outer diameter NN30 series cylindrical roller bearings. However, the tolerance of the housing washer is less than the diameter tolerance of cylindrical roller bearings, keeps sufficient radial clearance of the bearing bore. This ensures that the thrust bearing only carry axial load.

### tolerance

Standard ZWZ two-way thrust angular contact ball bearings in accordance with SP, UP grade production

Table 35 Shaft Washer

SP tolerance

| Shaft washer Inner diameter |     | $\Delta d_s$ |     | $S_i$   | $\Delta T_s$ |      |
|-----------------------------|-----|--------------|-----|---------|--------------|------|
| mm                          |     | $\mu m$      |     | $\mu m$ | $\mu m$      |      |
| Over                        | To  | High         | Low | max     | High         | Low  |
| 18                          | 30  | +1           | -9  | 3       | +50          | -80  |
| 30                          | 50  | +1           | -11 | 3       | +60          | -100 |
| 50                          | 80  | +2           | -14 | 4       | +70          | -120 |
| 80                          | 120 | +3           | -18 | 4       | +85          | -140 |
| 120                         | 180 | +3           | -21 | 5       | +95          | -160 |
| 180                         | 250 | +4           | -26 | 5       | +120         | -200 |

Table 36 housing washer

SP tolerance

| housing washer outer diameter |     | $\Delta d_s$ |     | $S_e$                                           | $\Delta C_s$ |     |
|-------------------------------|-----|--------------|-----|-------------------------------------------------|--------------|-----|
| mm                            |     | $\mu m$      |     | $\mu m$                                         | $\mu m$      |     |
| Over                          | To  | High         | Low | max                                             | High         | Low |
| 30                            | 50  | -20          | -27 | Si value is equal to same model of shaft washer | 0            | -60 |
| 50                            | 80  | -24          | -33 |                                                 | 0            | -60 |
| 80                            | 120 | -28          | -38 |                                                 | 0            | -60 |
| 120                           | 150 | -33          | -44 |                                                 | 0            | -60 |
| 150                           | 180 | -33          | -46 |                                                 | 0            | -60 |
| 180                           | 250 | -37          | -52 |                                                 | 0            | -60 |
| 250                           | 315 | -41          | -59 |                                                 | 0            | -60 |

Table 37 Shaft washer

SP tolerance

| Shaft washer Inner diameter |     | $\Delta d_s$ |     | $S_i$   | $\Delta T_s$ |      |
|-----------------------------|-----|--------------|-----|---------|--------------|------|
| mm                          |     | $\mu m$      |     | $\mu m$ | $\mu m$      |      |
| Over                        | To  | High         | Low | max     | High         | Low  |
| 18                          | 30  | 0            | -6  | 1.5     | +50          | -80  |
| 30                          | 50  | 0            | -8  | 1.5     | +60          | -100 |
| 50                          | 80  | 0            | -9  | 2       | +70          | -120 |
| 80                          | 120 | 0            | -10 | 2       | +85          | -140 |
| 120                         | 180 | 0            | -13 | 3       | +95          | -160 |
| 180                         | 250 | 0            | -15 | 3       | +120         | -200 |

Table38 housing washer

UP tolerance

| housing washer outer diameter |     | $\Delta d_s$ |     | $S_e$                                           | $\Delta C_s$ |     |
|-------------------------------|-----|--------------|-----|-------------------------------------------------|--------------|-----|
| mm                            |     | $\mu m$      |     | $\mu m$                                         | $\mu m$      |     |
| Over                          | To  | High         | Low | max                                             | High         | Low |
| 30                            | 50  | -20          | -27 | Si value is equal to same model of shaft washer | 0            | -60 |
| 50                            | 80  | -24          | -33 |                                                 | 0            | -60 |
| 80                            | 120 | -28          | -38 |                                                 | 0            | -60 |
| 120                           | 150 | -33          | -44 |                                                 | 0            | -60 |
| 150                           | 180 | -33          | -46 |                                                 | 0            | -60 |
| 180                           | 250 | -37          | -52 |                                                 | 0            | -60 |
| 250                           | 315 | -41          | -59 |                                                 | 0            | -60 |

## High precision axial and radial cylindrical roller bearings

### Structural features

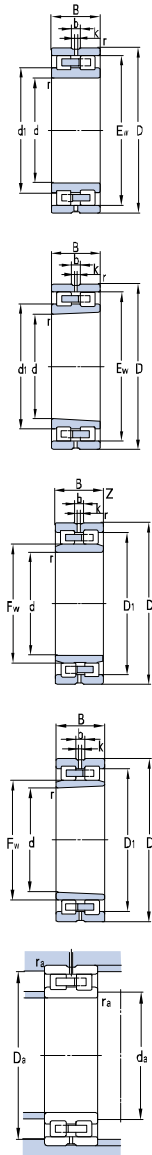
High precision axial and radial cylindrical roller bearings have up and down two row thrust cylindrical roller, and a set of full complement cylindrical roller composition. Therefore can capable of two-way axial load and the additional radial load as well as installation moment.

### Tolerance

Table 39

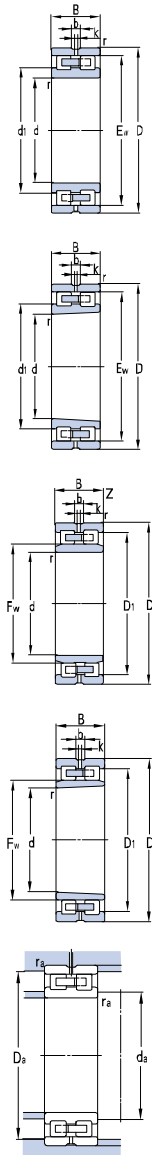
| Size tolerance |                    |                |                    | Installation size    |                       |                       |                      |                       | Axial/radial runout |
|----------------|--------------------|----------------|--------------------|----------------------|-----------------------|-----------------------|----------------------|-----------------------|---------------------|
| Inner diameter |                    | outer diameter |                    |                      |                       |                       |                      |                       |                     |
| d<br>mm        | $\Delta d_s$<br>mm | D<br>mm        | $\Delta D_s$<br>mm | H <sub>1</sub><br>mm | $\Delta H_{1s}$<br>mm | $\Delta H_{1s}$<br>mm | H <sub>2</sub><br>mm | $\Delta H_{2s}$<br>mm | Standard<br>$\mu m$ |
| 50             | -0.008             | 126            | -0.011             | 20                   | $\pm 0.125$           | $\pm 0.025$           | 10                   | $\pm 0.02$            | 2                   |
| 80             | -0.009             | 146            | -0.011             | 23.35                | $\pm 0.15$            | $\pm 0.025$           | 11.7                 | $\pm 0.02$            | 3                   |
| 100            | -0.01              | 185            | -0.015             | 25                   | $\pm 0.175$           | $\pm 0.025$           | 13                   | $\pm 0.02$            | 3                   |
| 120            | -0.01              | 210            | -0.015             | 26                   | $\pm 0.175$           | $\pm 0.025$           | 14                   | $\pm 0.02$            | 3                   |
| 150            | -0.013             | 240            | -0.015             | 26                   | $\pm 0.175$           | $\pm 0.03$            | 14                   | $\pm 0.02$            | 3                   |
| 180            | -0.013             | 280            | -0.018             | 29                   | $\pm 0.175$           | $\pm 0.03$            | 14                   | $\pm 0.025$           | 4                   |
| 200            | -0.015             | 300            | -0.018             | 30                   | $\pm 0.175$           | $\pm 0.03$            | 15                   | $\pm 0.025$           | 4                   |
| 260            | -0.018             | 385            | -0.02              | 36.5                 | 0.2                   | 0.04                  | 18.5                 | 0.025                 | 6                   |
| 325            | -0.023             | 450            | -0.029             | 40                   | $\pm 0.2$             | $\pm 0.05$            | 20                   | $\pm 0.025$           | 6                   |
| 395            | -0.023             | 525            | -0.028             | 42.5                 | $\pm 0.2$             | $\pm 0.05$            | 22.5                 | $\pm 0.025$           | 6                   |
| 460            | -0.023             | 600            | -0.028             | 46                   | 0.225                 | 0.06                  | 24                   | 0.03                  | 6                   |
| 580            | -0.025             | 750            | -0.035             | 60                   | $\pm 0.25$            | $\pm 0.075$           | 30                   | $\pm 0.03$            | 10                  |
| 650            | -0.038             | 870            | -0.05              | 78                   | $\pm 0.25$            | $\pm 0.1$             | 44                   | $\pm 0.03$            | 10                  |
| 850            | -0.05              | 1095           | -0.063             | 80.5                 | $\pm 0.3$             | $\pm 0.12$            | 43.5                 | $\pm 0.03$            | 12                  |
| 950            | -0.05              | 1200           | -0.063             | 86                   | $\pm 0.3$             | $\pm 0.12$            | 46                   | $\pm 0.03$            | 12                  |
| 1030           | -0.063             | 1300           | -0.08              | 92.5                 | 0.3                   | 0.15                  | 52.5                 | 0.03                  | 12                  |

# Double-row Cylindrical Roller Bearings



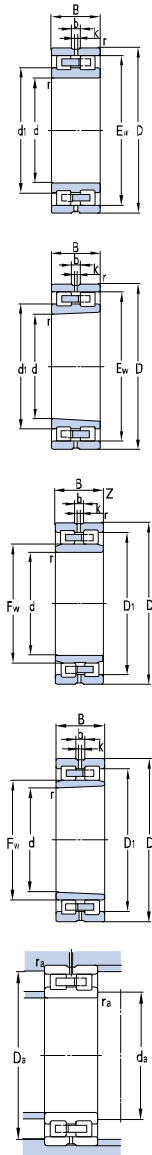
| Principal dimensions |     |    |     |                                 | Basic rating load |      | Limit rating speed |       |  | Designations | Other dimensions |     |     |   | Contact surface and chamfer dimensions |         |         | Weight |
|----------------------|-----|----|-----|---------------------------------|-------------------|------|--------------------|-------|--|--------------|------------------|-----|-----|---|----------------------------------------|---------|---------|--------|
| d                    | D   | B  | r   | E <sub>w</sub> , F <sub>w</sub> | Cr                | Cor  | Grease             | Oil   |  |              | d1               | D1  | b   | k | da(min)                                | Da(max) | ra(max) |        |
| mm                   |     |    |     |                                 | KN                |      | r/min              |       |  |              | mm               |     |     |   | mm                                     |         |         | kg     |
| 50                   | 80  | 23 | 1   | 72,5                            | 60,0              | 85   | 10000              | 13000 |  | NN3010K      | 61,3             |     |     |   | 55                                     | 75      | 1       | 0,428  |
|                      | 80  | 23 | 1   | 72,5                            | 60,0              | 84,5 | 10000              | 13000 |  | NN3010       | 61,3             |     |     |   | 55                                     | 75      | 1       | 0,431  |
| 60                   | 95  | 26 | 1,1 | 86,1                            | 77,0              | 114  | 9000               | 10000 |  | NN3012K      | 73,3             |     |     |   | 66                                     | 89      | 1       | 0,691  |
| 65                   | 100 | 26 | 1,1 | 91                              | 80                | 120  | 9000               | 10000 |  | NN3013K      |                  |     |     |   | 75                                     | 93      | 1,1     | 0,72   |
| 70                   | 100 | 30 | 1   | 80                              | 65                | 105  | 8000               | 9500  |  | NNU4914      |                  |     |     |   | 79                                     | 92      | 1       | 0,74   |
|                      | 110 | 30 | 1,1 | 100                             | 100               | 150  | 7500               | 9000  |  | NN3014       |                  |     |     |   | 82                                     | 102     | 1,1     | 1,05   |
| 75                   | 105 | 30 | 1,0 | 85                              | 65                | 115  | 7000               | 8500  |  | NNU4915      | 90,6             |     |     |   | 84                                     | 97      | 1       | 0,77   |
|                      | 115 | 30 | 1,1 | 105                             | 106               | 165  | 6700               | 8000  |  | NNU3015      | 90,6             |     |     |   | 87                                     | 107     | 1,1     | 1,07   |
| 80                   | 110 | 30 | 1   | 90                              | 71,5              | 135  | 6700               | 8000  |  | NNU4916      |                  |     |     |   | 89                                     | 102     | 1       | 0,80   |
|                      | 125 | 34 | 1,1 | 113                             | 130               | 207  | 6300               | 7500  |  | NN3016K      | 97               |     |     |   | 86,5                                   | 118,5   | 1       | 1,50   |
|                      | 125 | 34 | 1,1 | 113                             | 130               | 207  | 6300               | 7500  |  | NN3016K      | 97               |     |     |   | 86,5                                   | 118,5   | 1       | 1,50   |
| 85                   | 120 | 35 | 1,1 | 96,5                            | 98                | 175  | 6300               | 7500  |  | NNU4917      |                  |     |     |   | 96                                     | 111     | 1,1     | 1,21   |
|                      | 130 | 34 | 1,1 | 118                             | 135               | 224  | 6000               | 7000  |  | NN3017K      | 102              |     |     |   | 91,5                                   | 123,5   | 1       | 1,63   |
| 90                   | 140 | 37 | 1,5 | 127                             | 147               | 260  | 5600               | 6700  |  | NN3018       | 109,4            |     |     |   | 98                                     | 132     | 1,5     | 1,98   |
|                      | 140 | 37 | 1,5 | 127                             | 147               | 260  | 5600               | 6700  |  | NN3018K      | 109,4            |     | 6,5 | 4 | 98                                     | 132     | 1,5     | 1,92   |
| 95                   | 130 | 35 | 1,1 | 106,5                           | 96                | 186  | 5600               | 6700  |  | NNU4919      |                  |     |     |   | 106                                    | 121     | 1,1     | 1,33   |
|                      | 145 | 37 | 1,5 | 132                             | 135               | 224  | 5600               | 6700  |  | NN3019K      | 114,4            |     |     |   | 103                                    | 137     | 1,5     | 2,26   |
| 100                  | 140 | 40 | 1,1 | 113                             | 135               | 300  | 5300               | 6300  |  | NNU4920      |                  |     |     |   | 112                                    | 129     | 1,1     | 1,87   |
|                      | 150 | 37 | 1,5 | 137                             | 168               | 292  | 5300               | 6300  |  | NN3020K      | 119,4            |     |     |   | 108                                    | 142     | 1,5     | 2,20   |
|                      | 150 | 37 | 1,5 | 137                             | 168               | 292  | 5300               | 6300  |  | NN3020       | 119,4            |     |     |   | 108                                    | 142     | 1,5     | 2,25   |
|                      | 150 | 50 | 1,5 | 115                             | 168               | 292  | 5300               | 6300  |  | NNU4020      |                  | 133 |     |   | 108                                    | 142     | 1,5     | 3,11   |
| 105                  | 145 | 40 | 1,1 | 118                             | 130               | 280  | 5300               | 6300  |  | NNU4921      |                  |     |     |   | 117                                    | 134     | 1,1     | 1,95   |
|                      | 160 | 41 | 2,0 | 146                             | 192               | 350  | 4800               | 5600  |  | NN3021       | 125,2            |     |     |   | 116,5                                  | 154     | 1       | 2,94   |
|                      | 160 | 41 | 2,0 | 146                             | 192               | 350  | 4800               | 5600  |  | NN3021K      | 125,2            |     |     |   | 116,5                                  | 154     | 1       | 2,93   |
| 110                  | 150 | 40 | 1,1 | 123                             | 132               | 300  | 4800               | 5600  |  | NNU4922      |                  |     |     |   | 122                                    | 139     | 1,1     | 2,05   |

# Double-row Cylindrical Roller Bearings



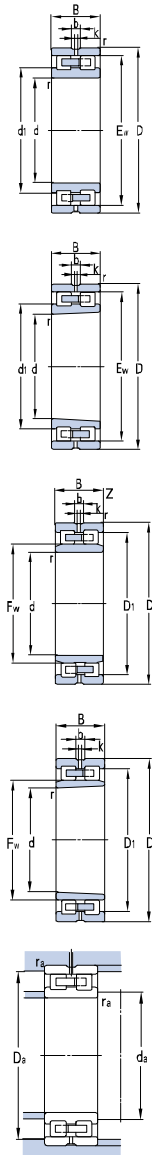
| Principal dimensions |     |    |     |        | Basic rating load |      | Limit rating speed |      |  | Designations  | Other dimensions |       |     |   | Contact surface and chamfer dimensions |         |         | Weight |
|----------------------|-----|----|-----|--------|-------------------|------|--------------------|------|--|---------------|------------------|-------|-----|---|----------------------------------------|---------|---------|--------|
| d                    | D   | B  | r   | Ew, Fw | Cr                | Cor  | Grease             | Oil  |  |               | d1               | D1    | b   | k | da(min)                                | Da(max) | ra(max) |        |
| mm                   |     |    |     |        | KN                |      | r/min              |      |  |               | mm               |       |     |   | mm                                     |         |         | kg     |
| 110                  | 170 | 45 | 2.0 | 155    | 220               | 405  | 5000               | 6000 |  | NN3022K       | 132.6            |       |     |   | 116.5                                  | 163     | 1       | 3.73   |
|                      | 170 | 45 | 2.0 | 155    | 220               | 405  | 5000               | 6000 |  | NN3022KL      | 132.6            |       | 12  | 4 | 116.5                                  | 163     | 1       | 3.54   |
|                      | 170 | 45 | 2.0 | 155    | 220               | 405  | 5000               | 6000 |  | NN3022        | 132.6            |       |     |   | 116.5                                  | 163     | 1       | 3.74   |
| 120                  | 165 | 45 | 1.1 | 134.5  | 185               | 385  | 4500               | 5300 |  | NNU4924       |                  |       |     |   | 133                                    | 155     | 1.1     | 2.72   |
|                      | 180 | 46 | 2.0 | 165    | 243               | 445  | 4300               | 5000 |  | NN3024K       | 142.6            |       |     |   | 130                                    | 171     | 2       | 3.85   |
|                      | 180 | 46 | 2.0 | 160    | 243               | 445  | 4300               | 5000 |  | NN3024        | 142.6            |       |     |   | 130                                    | 171     | 2       | 3.86   |
| 130                  | 180 | 50 | 1.5 | 146    | 205               | 420  | 4000               | 4800 |  | NNU4926       |                  |       |     |   | 145                                    | 166     | 1.5     | 3.75   |
|                      | 200 | 52 | 2.0 | 182    | 305               | 530  | 3800               | 4500 |  | NN3026        | 156.4            |       |     |   | 139                                    | 191     | 2       | 5.54   |
|                      | 200 | 52 | 2.0 | 182    | 305               | 530  | 3800               | 4500 |  | NN3026K       | 156.4            |       |     |   | 139                                    | 191     | 2       | 5.34   |
| 140                  | 190 | 50 | 1.5 | 156    | 199               | 405  | 3800               | 4500 |  | NNU4928       |                  | 172   |     |   | 149                                    | 182     | 2       | 4.19   |
|                      | 210 | 53 | 2.0 | 160    | 320               | 575  | 3800               | 4500 |  | NNU3028/C9W33 |                  | 185.6 | 9.6 | 5 | 149                                    | 201     | 2       | 6.18   |
|                      | 210 | 53 | 2.0 | 192    | 320               | 575  | 3800               | 4500 |  | NN3028K       | 166.4            |       |     |   | 149                                    | 201     | 2       | 6.05   |
|                      | 210 | 53 | 2.0 | 192    | 320               | 575  | 3800               | 4500 |  | NN3028        | 166.4            |       |     |   | 149                                    | 201     | 2       | 6.05   |
| 150                  | 210 | 60 | 2.0 | 168.5  | 350               | 675  | 3600               | 4300 |  | NNU4930       |                  |       |     |   | 167                                    | 197     | 2.0     | 6.15   |
|                      | 225 | 56 | 2.1 | 206    | 363               | 650  | 3400               | 4000 |  | NN3030K       | 178.8            |       |     |   | 161                                    | 214     | 2       | 7.70   |
|                      | 225 | 56 | 2.1 | 206    | 363               | 650  | 3400               | 4000 |  | NN3030        | 178.8            |       |     |   | 161                                    | 214     | 2       | 7.75   |
| 160                  | 220 | 60 | 2.0 | 178.5  | 340               | 680  | 3400               | 4000 |  | NNU4932       |                  |       |     |   | 177                                    | 207     | 2.0     | 6.42   |
|                      | 240 | 60 | 2.1 | 219    | 380               | 675  | 3200               | 3800 |  | NN3032K       | 190.2            |       |     |   | 171                                    | 229     | 2       | 8.39   |
|                      | 240 | 60 | 2.1 | 219    | 380               | 335  | 3200               | 3800 |  | NN3032KTn1    | 190.2            |       |     |   | 171                                    | 229     | 2       | 7.86   |
|                      | 240 | 60 | 2.1 | 219    | 380               | 675  | 3200               | 3800 |  | NN3032        | 190.2            |       |     |   | 171                                    | 229     | 2       | 8.38   |
| 170                  | 230 | 60 | 2.0 | 188.5  | 350               | 720  | 3200               | 3800 |  | NNU4934       |                  |       |     |   | 187                                    | 217     | 2.0     | 6.74   |
|                      | 260 | 67 | 2.1 | 236    | 470               | 860  | 3000               | 3600 |  | NN3034K       | 204              |       |     |   | 181                                    | 249     | 2       | 12.9   |
|                      | 260 | 67 | 2.1 | 236    | 470               | 860  | 3000               | 3600 |  | NN3034        | 204              |       |     |   | 181                                    | 249     | 2       | 13.3   |
| 180                  | 250 | 69 | 2.3 | 201    | 382               | 703  | 3000               | 3600 |  | NNU4936K      |                  | 228   |     |   | 191                                    | 239     | 2       | 9.80   |
|                      | 280 | 74 | 2.1 | 255    | 605               | 1090 | 2800               | 3400 |  | NN3036K       | 218.2            |       |     |   | 191                                    | 269     | 2       | 16.9   |
|                      | 280 | 74 | 2.1 | 255    | 605               | 1090 | 2800               | 3400 |  | NN3036        | 218.2            |       |     |   | 191                                    | 269     | 2       | 16.9   |
| 190                  | 260 | 69 | 3.0 | 212    | 616               | 1250 | 2800               | 3400 |  | NNU4938B      |                  | 257   | 9.5 | 5 | 201                                    | 249     | 2       | 11     |

# Double-row Cylindrical Roller Bearings



| Principal dimensions |     |     |     |        | Basic rating load |      | Limit rating speed |      |  | Designations | Other dimensions |     |      |     | Contact surface and chamfer dimensions |         |         | Weight |
|----------------------|-----|-----|-----|--------|-------------------|------|--------------------|------|--|--------------|------------------|-----|------|-----|----------------------------------------|---------|---------|--------|
| d                    | D   | B   | r   | Ew, Fw | Cr                | Cor  | Grease             | Oil  |  |              | d1               | D1  | b    | k   | da(min)                                | Da(max) | ra(max) |        |
| mm                   |     |     |     |        | KN                |      | r/min              |      |  |              | mm               |     |      |     | mm                                     |         |         | kg     |
| 190                  | 290 | 75  | 2.1 | 265    | 622               | 1140 | 2600               | 3200 |  | NN3038K      | 228.2            |     |      |     | 201                                    | 279     | 2       | 17.9   |
|                      | 290 | 75  | 2.1 | 265    | 622               | 1140 | 2600               | 3200 |  | NN3038       | 228.2            |     |      |     | 201                                    | 279     | 2       | 18.0   |
|                      | 290 | 180 | 2.1 | 219    | 1390              | 3200 | 2600               | 3200 |  | NNU6038      |                  | 236 |      |     | 201                                    | 279     | 2       | 43.6   |
| 200                  | 280 | 80  | 2.1 | 225    | 520               | 1120 | 2600               | 3200 |  | NNU4940      |                  |     |      |     | 223                                    | 259     | 2.1     | 14.9   |
|                      | 310 | 82  | 2.1 | 282    | 675               | 1340 | 2400               | 3000 |  | NN3040K      | 242              |     |      |     | 211                                    | 299     | 2       | 22.0   |
|                      | 310 | 82  | 2.1 | 282    | 675               | 1340 | 2400               | 3000 |  | NN3040       | 242              |     |      |     | 211                                    | 299     | 2       | 22.1   |
| 220                  | 300 | 80  | 2.1 | 245    | 530               | 1200 | 2400               | 3000 |  | NNU4944K     |                  | 273 | 12.2 | 6   | 231                                    | 289     | 2       | 16.6   |
|                      | 340 | 90  | 3.0 | 310    | 875               | 1610 | 2200               | 2800 |  | NN3044K      | 265.2            |     |      |     | 233                                    | 327     | 2.5     | 30.1   |
|                      | 340 | 90  | 3.0 | 310    | 875               | 1610 | 2200               | 2800 |  | NN3044       | 265.2            |     |      |     | 233                                    | 327     | 2.5     | 31.0   |
| 240                  | 320 | 80  | 2.1 | 265    | 625               | 1470 | 2200               | 2800 |  | NNU4948K     |                  | 295 | 12.2 | 6   | 251                                    | 309     | 2       | 17.7   |
|                      | 360 | 92  | 3.0 | 330    | 885               | 1690 | 2000               | 2600 |  | NN3048K      | 285.2            |     |      |     | 253                                    | 347     | 2.5     | 32.7   |
|                      | 360 | 92  | 3.0 | 330    | 885               | 1690 | 2000               | 2600 |  | NN3048       | 285.2            |     |      |     | 253                                    | 347     | 2.5     | 31.6   |
| 260                  | 360 | 100 | 2.1 | 292    | 760               | 2030 | 2000               | 2600 |  | NNU4952      |                  | 325 | 15   | 6   | 273                                    | 347     | 2.6     | 31.7   |
|                      | 400 | 104 | 4.0 | 364    | 1110              | 2120 | 1900               | 2600 |  | NN3052K      | 312.8            |     |      |     | 276                                    | 384     | 3       | 49.3   |
|                      | 440 | 180 | 4.0 | 306    | 2240              | 4500 | 1900               | 2600 |  | NNU4152      |                  | 387 |      |     | 276                                    | 424     | 3       | 111    |
|                      | 400 | 140 | 4   | 295    | 1570              | 3000 | 1900               | 2600 |  | NNU4052      |                  | 358 | 13.9 | 7.5 | 276                                    | 384     | 3       | 63.4   |
|                      | 360 | 100 | 2.1 | 292    | 760               | 2030 | 1900               | 2600 |  | NNU4952K     | 326              |     | 15   | 6   | 273                                    | 347     | 2.7     | 30.4   |
| 280                  | 380 | 100 | 2.1 | 309    | 870               | 2200 | 1900               | 2400 |  | NNU4956K     |                  | 347 | 15   | 6   | 291                                    | 369     | 2       | 27.5   |
|                      | 380 | 100 | 2.1 | 309    | 870               | 2200 | 1900               | 2400 |  | NNU4956      |                  | 347 |      |     | 291                                    | 369     | 2       | 29     |
|                      | 420 | 106 | 4.0 | 384    | 1170              | 2290 | 1800               | 2200 |  | NN3056K      | 332.8            |     |      |     | 296                                    | 404     | 3       | 49.7   |
|                      | 420 | 106 | 4.0 | 384    | 1170              | 2290 | 1800               | 2200 |  | NN3056       | 332.8            |     |      |     | 296                                    | 404     | 3       | 52.3   |
|                      | 460 | 180 | 5   | 326    | 2500              | 4700 | 1700               | 2000 |  | NNU4156      |                  | 407 |      |     | 300                                    | 440     | 4       | 118    |
| 300                  | 420 | 118 | 3.0 | 339    | 1050              | 2800 | 1600               | 1900 |  | NNU4960      |                  | 379 | 17.7 | 9   | 314                                    | 406     | 2.5     | 51.6   |
|                      | 460 | 118 | 4.0 | 418    | 1290              | 2790 | 1600               | 1900 |  | NN3060K      | 360.4            |     |      |     | 316                                    | 444     | 3       | 76.2   |
|                      | 460 | 118 | 4.0 | 418    | 1290              | 2790 | 1600               | 1900 |  | NN3060       | 360.4            |     |      |     | 316                                    | 444     | 3       | 77.9   |
|                      | 420 | 118 | 3.0 | 339    | 1150              | 2800 | 1700               | 2000 |  | NNU4960K     |                  | 379 | 17.7 | 9   | 314                                    | 406     | 2.5     | 49.3   |
| 320                  | 440 | 118 | 3.0 | 359    | 1090              | 3040 | 1600               | 1900 |  | NNU4964      |                  | 399 | 17.7 | 9   | 334                                    | 426     | 2.5     | 54.9   |
|                      | 480 | 121 | 4.0 | 438    | 1360              | 2910 | 1600               | 1900 |  | NN3064       | 377              |     | 17.7 | 8   | 336                                    | 464     | 3       | 76.3   |
|                      | 480 | 121 | 4.0 | 438    | 1360              | 2910 | 1600               | 1900 |  | NN3064K      | 377              |     | 17.7 | 8   | 336                                    | 464     | 3       | 72.8   |

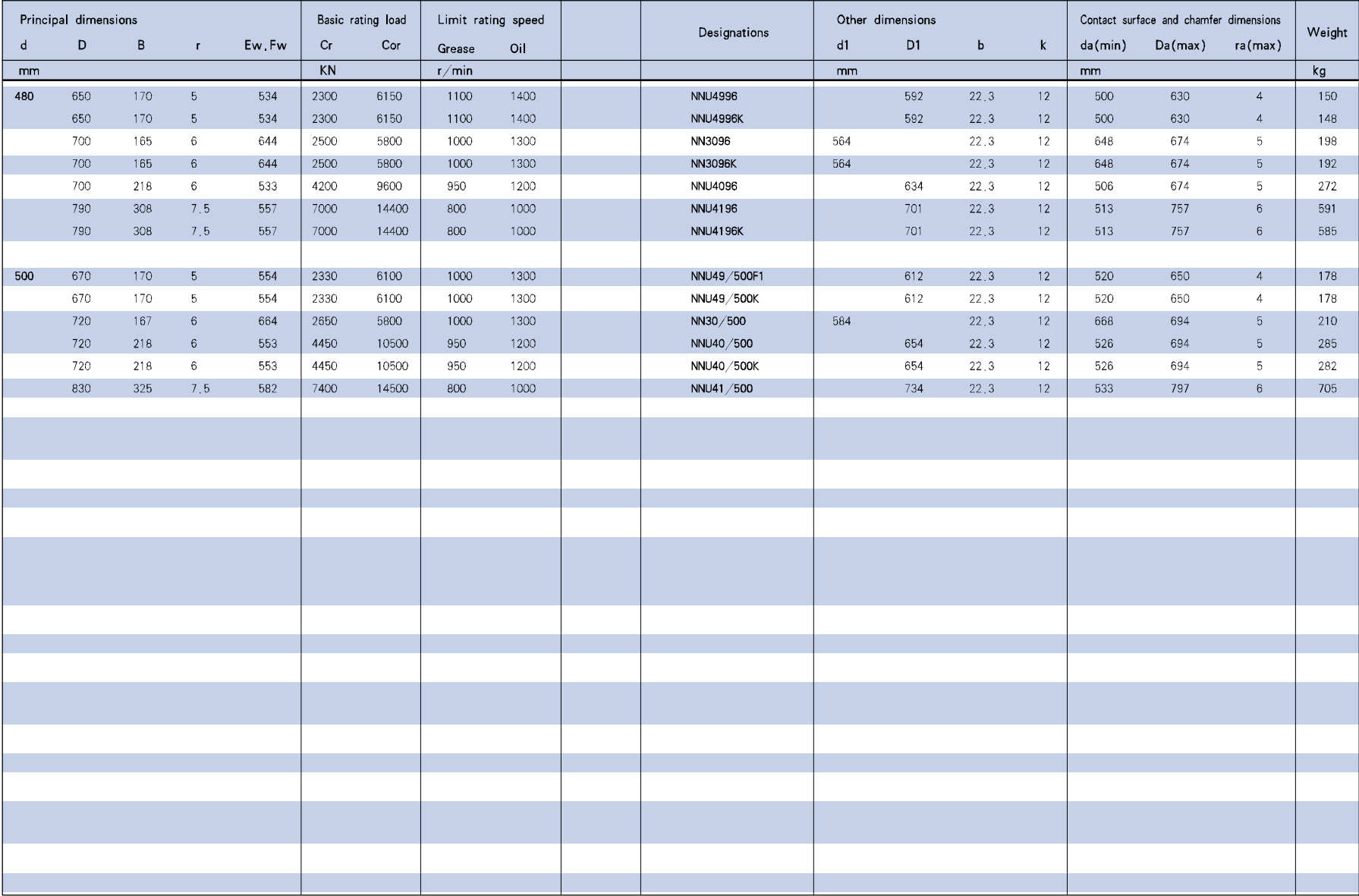
# Double-row Cylindrical Roller Bearings



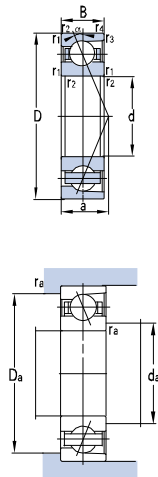
| Principal dimensions |     |     |     |                                 | Basic rating load |       | Limit rating speed |      |  | Designations | Other dimensions |     |      |     | Contact surface and chamfer dimensions |         |         | Weight |
|----------------------|-----|-----|-----|---------------------------------|-------------------|-------|--------------------|------|--|--------------|------------------|-----|------|-----|----------------------------------------|---------|---------|--------|
| d                    | D   | B   | r   | E <sub>w</sub> , F <sub>w</sub> | Cr                | Cor   | Grease             | Oil  |  |              | d1               | D1  | b    | k   | da(min)                                | Da(max) | ra(max) |        |
| mm                   |     |     |     |                                 | KN                |       | r/min              |      |  |              | mm               |     |      |     | mm                                     |         |         | kg     |
| 340                  | 580 | 243 | 5   | 402                             | 4000              | 7550  | 1400               | 1700 |  | NNU4168      |                  | 510 |      |     | 360                                    | 560     | 4       | 267    |
|                      | 520 | 180 | 5   | 385                             | 2490              | 4800  | 1500               | 1800 |  | NNU4068      |                  | 460 | 12   | 6   | 360                                    | 500     | 4       | 136    |
|                      | 520 | 133 | 5   | 473                             | 1730              | 3780  | 1500               | 1800 |  | NN3068K      | 406              |     | 16.7 | 9   | 360                                    | 500     | 4       | 99.5   |
| 360                  | 480 | 118 | 3.0 | 399                             | 1420              | 3150  | 1500               | 1800 |  | NNU4972      |                  |     |      |     | 396                                    | 449     | 3       | 57.5   |
|                      | 540 | 134 | 5.0 | 493                             | 1940              | 3900  | 1400               | 1700 |  | NN3072K      | 426              |     | 17.7 | 12  | 380                                    | 497     | 4       | 105    |
| 380                  | 520 | 140 | 4.0 | 426                             | 1500              | 3600  | 1400               | 1700 |  | NNU4976      |                  |     |      |     | 423                                    | 482     | 4       | 85.8   |
|                      | 560 | 135 | 5.0 | 515                             | 1800              | 4100  | 1300               | 1600 |  | NN3076K      | 448              |     | 17.7 | 12  | 400                                    | 517     | 4       | 110    |
|                      | 620 | 243 | 5.0 | 442                             | 4130              | 8350  | 700                | 850  |  | NNU4176      |                  | 538 |      |     | 400                                    | 580     | 4       | 288    |
| 400                  | 600 | 148 | 5   | 549                             | 2360              | 4750  | 1200               | 1500 |  | NN3080K      | 472              |     |      |     | 426                                    | 580     | 4       | 141    |
|                      | 650 | 250 | 6   | 463                             | 4700              | 9550  | 1000               | 1250 |  | NNU4180      |                  | 568 |      |     | 426                                    | 624     | 5       | 328    |
|                      | 540 | 140 | 4   | 446                             | 1700              | 4500  | 1200               | 1600 |  | NNU4980K     |                  | 491 | 16.7 | 8   | 416                                    | 524     | 3       | 90.6   |
| 420                  | 560 | 140 | 4.0 | 466                             | 1650              | 4750  | 1300               | 1600 |  | NNU4984K     |                  | 515 | 17.7 | 9   | 436                                    | 539     | 2       | 93.3   |
|                      | 620 | 200 | 5   | 469                             | 3450              | 7500  | 1100               | 1400 |  | NNU4084      |                  | 556 | 16.7 | 9   | 440                                    | 600     | 4       | 204    |
|                      | 620 | 150 | 5   | 569                             | 2100              | 4500  | 1200               | 1500 |  | NN3084K      | 497              |     | 16.7 | 9   | 574                                    | 600     | 4       | 135    |
| 440                  | 640 | 230 | 6.0 | 482                             | 4790              | 10400 | 1100               | 1400 |  | NNP4088X3    |                  | 602 | 16.7 | 7.5 | 466                                    | 614     | 5       | 256    |
|                      | 540 | 100 | 2.1 | 471                             | 1000              | 3000  | 1300               | 1600 |  | NNU4888K     |                  | 505 | 16.7 | 9   | 448                                    | 529     | 2       | 49     |
|                      | 540 | 100 | 2.1 | 471                             | 1000              | 3000  | 1300               | 1600 |  | NNU4888      |                  | 505 | 16.7 | 9   | 448                                    | 529     | 2       | 49     |
|                      | 650 | 212 | 6   | 487                             | 3850              | 8250  | 1100               | 1400 |  | NNU4088      |                  | 582 | 22.3 | 12  | 466                                    | 624     | 5       | 214    |
|                      | 650 | 212 | 6   | 487                             | 3850              | 8250  | 1100               | 1400 |  | NNU4088K     |                  | 582 | 22.3 | 12  | 466                                    | 624     | 5       | 214    |
|                      | 720 | 280 | 6   | 511                             | 5650              | 11500 | 1000               | 1300 |  | NNU4188K30M  |                  | 638 | 22.3 | 12  | 466                                    | 694     | 5       | 452    |
|                      | 720 | 280 | 6   | 511                             | 5650              | 11500 | 1000               | 1300 |  | NNU4188      |                  | 638 | 22.3 | 12  | 466                                    | 694     | 5       | 452    |
| 460                  | 680 | 163 | 6.0 | 624                             | 2600              | 6200  | 1100               | 1400 |  | NN3092K      | 544              |     | 20.5 | 12  | 486                                    | 627     | 5       | 198    |
|                      | 580 | 118 | 3   | 497                             | 1150              | 3250  | 1300               | 1700 |  | NNU4892K     |                  | 537 | 16.7 | 9   | 474                                    | 566     | 2.5     | 75     |
|                      | 580 | 118 | 3   | 497                             | 1150              | 3250  | 1200               | 1600 |  | NNU4892      |                  | 537 | 16.7 | 9   | 474                                    | 566     | 2.5     | 75     |
|                      | 620 | 160 | 4   | 510                             | 2000              | 5400  | 1200               | 1600 |  | NNU4992      |                  | 565 | 16.7 | 9   | 476                                    | 604     | 3       | 132    |
|                      | 620 | 160 | 4   | 510                             | 2000              | 5400  | 1200               | 1600 |  | NNU4992K     |                  | 565 | 16.7 | 9   | 476                                    | 604     | 3       | 128    |
|                      | 680 | 218 | 6   | 513                             | 4250              | 9300  | 1000               | 1300 |  | NNU4092      |                  | 614 | 22.3 | 12  | 486                                    | 654     | 5       | 238    |
|                      | 680 | 218 | 6   | 513                             | 4250              | 9300  | 1000               | 1300 |  | NNU4092K     |                  | 614 | 22.3 | 12  | 486                                    | 654     | 5       | 235    |
|                      | 760 | 300 | 7.5 | 537                             | 6350              | 13000 | 800                | 900  |  | NNU4192K30   |                  | 672 |      |     | 493                                    | 727     | 6       | 533    |
|                      | 760 | 300 | 7.5 | 537                             | 6350              | 13000 | 800                | 900  |  | NNU4192      |                  | 672 |      |     | 493                                    | 727     | 6       | 535    |



## 37

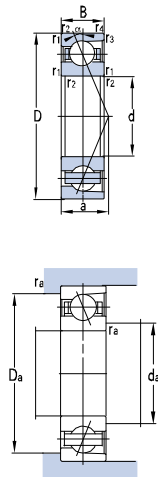


# High-precision Angular Contact Ball Bearings



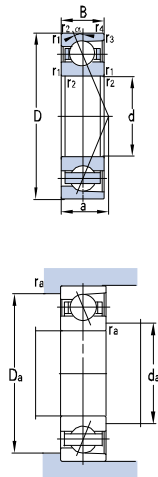
| Principal dimensions |     |    |        |        | Basic rating load |      |  | Limit rating speed |       | Designations | Contact points<br>a | Installation Dimensions |         |         | Weight |
|----------------------|-----|----|--------|--------|-------------------|------|--|--------------------|-------|--------------|---------------------|-------------------------|---------|---------|--------|
| d                    | D   | B  | r12min | r34min | Cr                | Cor  |  | Grease             | Oil   |              |                     | da(max)                 | Da(max) | ra(max) |        |
| mm                   |     |    |        |        | KN                |      |  | r/min              |       |              | mm                  | mm                      |         |         | kg     |
| 25                   | 47  | 12 | 0.6    | 0.3    | 11.5              | 7.5  |  | 25000              | 35000 | 7005C        | 11                  | 30                      | 42      | 0.6     | 0.078  |
|                      | 47  | 12 | 0.6    | 0.3    | 11                | 7.1  |  | 20000              | 30000 | 7005AC       | 11                  | 30                      | 42      | 0.6     | 0.078  |
|                      | 52  | 15 | 1      | 0.6    | 16.5              | 10.5 |  | 22000              | 32000 | 7205C        | 13                  | 31                      | 46      | 1       | 0.127  |
|                      | 52  | 15 | 1      | 0.6    | 16                | 10.0 |  | 19500              | 28500 | 7205AC       | 13                  | 31                      | 46      | 1       | 0.127  |
| 30                   | 55  | 13 | 1      | 0.3    | 15.5              | 10.5 |  | 18500              | 28500 | 7006C        | 12                  | 36                      | 49      | 1       | 0.113  |
|                      | 55  | 13 | 1      | 0.3    | 14.5              | 10.0 |  | 18000              | 28000 | 7006AC       | 12                  | 36                      | 49      | 1       | 0.113  |
|                      | 62  | 16 | 1      | 0.6    | 23                | 14.5 |  | 18500              | 28000 | 7206C        | 14                  | 36                      | 56      | 1       | 0.196  |
|                      | 62  | 16 | 1      | 0.6    | 23                | 14.5 |  | 18500              | 28000 | 7206AC       | 14                  | 36                      | 56      | 1       | 0.196  |
| 35                   | 72  | 17 | 1.1    | 0.6    | 32.5              | 22.0 |  | 9000               | 12000 | 7207C        | 15.7                | 42                      | 65      | 1       | 0.304  |
| 40                   | 80  | 18 | 1.1    | 0.6    | 36.4              | 25.0 |  | 8000               | 11000 | 7208C        | 17                  | 47                      | 73      | 1       | 0.364  |
|                      | 80  | 18 | 1.1    | 0.6    | 47.2              | 21.5 |  | 10000              | 15000 | 7208CTN1     | 17                  | 47                      | 73      | 1       | 0.312  |
| 45                   | 85  | 19 | 1.1    | 0.6    | 40.3              | 29.0 |  | 12000              | 17000 | 7209C        | 18.2                | 52                      | 78      | 1       | 0.403  |
| 50                   | 80  | 16 | 1      | 0.3    | 26.5              | 17.3 |  | 8000               | 10000 | 7010CM       | 16.7                | 57                      | 73      | 1       | 0.309  |
|                      | 80  | 16 | 1      | 0.3    | 25.0              | 20.5 |  | 7000               | 9000  | 7010ACM      | 23.2                | 57                      | 73      | 1       | 0.314  |
|                      | 90  | 20 | 1.1    | 0.6    | 42.9              | 32.0 |  | 7600               | 10000 | 7210C        | 19.4                | 57                      | 83      | 1       | 0.458  |
|                      | 90  | 20 | 1.1    | 0.6    | 40.3              | 30.0 |  | 5800               | 7800  | 7210AC       | 26.3                | 57                      | 83      | 1       | 0.460  |
| 55                   | 90  | 18 | 1.1    | 0.6    | 31.2              | 26.0 |  | 10000              | 12000 | 7011AC       | 25.9                | 62                      | 83      | 1       | 0.385  |
|                      | 100 | 21 | 1.5    | 0.6    | 53.3              | 40.0 |  | 8000               | 10000 | 7211C        | 20.9                | 64                      | 91      | 1.5     | 0.599  |
|                      | 100 | 21 | 1.5    | 0.6    | 50.7              | 38.0 |  | 7100               | 10000 | 7211AC       | 28.6                | 64                      | 91      | 1.5     | 0.599  |
|                      | 100 | 21 | 1.5    | 0.6    | 53.3              | 40.0 |  | 10000              | 14000 | 7211CM       | 20.9                | 65                      | 91      | 1.5     | 0.698  |
|                      | 100 | 21 | 1.5    | 0.6    | 50.7              | 32.0 |  | 10000              | 14000 | 7211C        | 20.9                | 65                      | 91      | 1.5     | 0.578  |
| 60                   | 95  | 18 | 1.1    | 0.6    | 35.1              | 30.0 |  | 7100               | 10000 | 7012AC       | 27.1                | 67                      | 88      | 1       | 0.392  |
|                      | 110 | 22 | 1.5    | 0.6    | 55.9              | 43.0 |  | 6700               | 9000  | 7212AC       | 30.8                | 69                      | 101     | 1.5     | 0.786  |
|                      | 110 | 22 | 1.5    | 0.6    | 55.9              | 43.0 |  | 6700               | 9000  | 7212ACM      | 30.8                | 69                      | 101     | 1.5     | 0.951  |
|                      | 110 | 22 | 1.5    | 0.6    | 58.5              | 45.0 |  | 9500               | 13000 | 7212C        | 22.4                | 69                      | 101     | 1.5     | 0.786  |
| 65                   | 100 | 18 | 1.1    | 0.6    | 33.8              | 31.0 |  | 6700               | 9500  | 7013AC       | 28.2                | 72                      | 93      | 1       | 0.414  |
|                      | 100 | 18 | 1.1    | 0.6    | 33.8              | 31.0 |  | 6700               | 9500  | 7013ACM      | 28.2                | 72                      | 93      | 1       | 0.504  |
|                      | 120 | 23 | 1.5    | 0.6    | 72.8              | 59.0 |  | 9000               | 12000 | 7213C        | 23.9                | 74                      | 111     | 1.5     | 1.02   |

# High-precision Angular Contact Ball Bearings



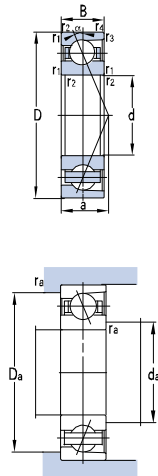
| Principal dimensions |     |    |        |        | Basic rating load |      |  | Limit rating speed |       | Designations | Contact points<br>a | Installation Dimensions |         |         | Weight |
|----------------------|-----|----|--------|--------|-------------------|------|--|--------------------|-------|--------------|---------------------|-------------------------|---------|---------|--------|
| d                    | D   | B  | r12min | r34min | Cr                | Cor  |  | Grease             | Oil   |              |                     | da(max)                 | Da(max) | ra(max) |        |
| mm                   |     |    |        |        | KN                |      |  | r/min              |       |              | mm                  | mm                      |         |         | kg     |
| 65                   | 120 | 23 | 1.5    | 0.6    | 70.2              | 56.0 |  | 6000               | 8500  | 7213ACM      | 33.1                | 74                      | 111     | 1.5     | 1.16   |
|                      | 120 | 23 | 1.5    | 0.6    | 70.2              | 56.0 |  | 6000               | 8500  | 7213AC/YB5   | 33.1                | 74                      | 111     | 1.5     | 1.02   |
|                      | 120 | 23 | 1.5    | 0.6    | 72.8              | 59.0 |  | 9000               | 12000 | 7213CM       | 23.9                | 74                      | 111     | 1.5     | 1.16   |
|                      |     |    |        |        |                   |      |  |                    |       |              |                     |                         |         |         |        |
| 70                   | 110 | 20 | 1.1    | 0.6    | 44.2              | 41.0 |  | 6300               | 8500  | 7014AC       | 31                  | 77                      | 103     | 1       | 0.626  |
|                      | 110 | 20 | 1.1    | 0.6    | 44.2              | 41.0 |  | 6300               | 8500  | 7014ACM      | 31                  | 77                      | 103     | 1       | 0.725  |
|                      | 125 | 24 | 1.5    | 0.6    | 79.3              | 65.0 |  | 8500               | 11000 | 7214CM       | 25.1                | 79                      | 116     | 1.5     | 1.26   |
|                      | 125 | 24 | 1.5    | 0.6    | 79.3              | 65.0 |  | 8500               | 11000 | 7214C        | 25.1                | 79                      | 116     | 1.5     | 1.10   |
|                      | 125 | 24 | 1.5    | 0.6    | 75.4              | 62.0 |  | 5600               | 8000  | 7214ACM      | 34.7                | 79                      | 116     | 1.5     | 1.26   |
|                      | 125 | 24 | 1.5    | 0.6    | 75.4              | 62.0 |  | 5600               | 8000  | 7214AC       | 34.7                | 79                      | 116     | 1.5     | 1.10   |
|                      | 125 | 24 | 1.5    | 0.6    | 79.3              | 65.0 |  | 8500               | 11000 | 7214CTN1     | 25.1                | 79                      | 116     | 1.5     | 1.09   |
|                      |     |    |        |        |                   |      |  |                    |       |              |                     |                         |         |         |        |
| 75                   | 130 | 25 | 1.5    | 0.6    | 78.7              | 66.5 |  | 6800               | 8500  | 7215C        | 26.2                | 84                      | 121     | 1.5     | 1.24   |
|                      | 130 | 25 | 1.5    | 0.6    | 79.3              | 67.0 |  | 5600               | 7500  | 7215ACM      | 36.4                | 84                      | 121     | 1.5     | 1.29   |
|                      | 130 | 25 | 1.5    | 0.6    | 79.3              | 67.0 |  | 5600               | 7500  | 7215AC       | 36.4                | 84                      | 121     | 1.5     | 1.18   |
|                      | 130 | 25 | 1.5    | 0.6    | 79.3              | 67.0 |  | 4480               | 6000  | 7215ACTN1    | 36.4                | 84                      | 121     | 1.5     | 1.21   |
|                      |     |    |        |        |                   |      |  |                    |       |              |                     |                         |         |         |        |
| 80                   | 125 | 22 | 1.1    | 0.6    | 55.9              | 53.0 |  | 6500               | 8000  | 7016CA       | 24.7                | 87                      | 118     | 1       | 0.845  |
|                      | 125 | 22 | 1.1    | 0.6    | 55.9              | 53.0 |  | 5600               | 7500  | 7016ACM      | 34.9                | 87                      | 118     | 1       | 0.983  |
|                      | 140 | 26 | 2      | 1      | 97.5              | 83.0 |  | 7500               | 10000 | 7216CM       | 27.7                | 90                      | 130     | 2       | 1.74   |
|                      | 140 | 26 | 2      | 1      | 92.3              | 79.0 |  | 5000               | 7100  | 7216ACM      | 38.7                | 90                      | 130     | 2       | 1.73   |
|                      | 140 | 26 | 2      | 1      | 92.3              | 79.0 |  | 5000               | 7100  | 7216AC       | 38.7                | 90                      | 130     | 2       | 1.48   |
|                      |     |    |        |        |                   |      |  |                    |       |              |                     |                         |         |         |        |
| 85                   | 130 | 22 | 1.1    | 0.6    | 57.2              | 56.0 |  | 5300               | 7100  | 7017ACM      | 36.1                | 92                      | 123     | 1       | 1.12   |
|                      | 130 | 22 | 1.1    | 0.6    | 57.2              | 56.0 |  | 5300               | 7100  | 7017AC       | 36.1                | 92                      | 123     | 1       | 0.95   |
|                      | 150 | 28 | 2      | 1      | 104               | 90.0 |  | 6700               | 9500  | 7217CM       | 29.7                | 95                      | 140     | 2       | 1.72   |
|                      | 150 | 28 | 2      | 1      | 98.8              | 86.0 |  | 4800               | 6700  | 7217AC       | 41.4                | 95                      | 140     | 2       | 1.91   |
|                      | 150 | 28 | 2      | 1      | 98.8              | 86.0 |  | 4800               | 6700  | 7217ACTN1    | 41.4                | 95                      | 140     | 2       | 1.96   |
|                      | 150 | 28 | 2      | 1      | 98.8              | 86.0 |  | 4800               | 6700  | 7217ACM      | 41.4                | 95                      | 140     | 2       | 1.72   |
|                      |     |    |        |        |                   |      |  |                    |       |              |                     |                         |         |         |        |
| 90                   | 140 | 24 | 1.5    | 0.6    | 67.6              | 66.0 |  | 4800               | 6700  | 7018ACM      | 38.8                | 99                      | 131     | 1.5     | 1.39   |
|                      | 140 | 24 | 1.5    | 0.6    | 69.0              | 66.0 |  | 4800               | 6700  | 7018ACMA     | 38.8                | 99                      | 131     | 1.5     | 1.37   |
|                      | 160 | 30 | 2      | 1      | 122               | 105  |  | 6300               | 9000  | 7218CM       | 31.7                | 100                     | 150     | 2       | 2.47   |
|                      | 160 | 30 | 2      | 1      | 122               | 105  |  | 6300               | 9000  | 7218C        | 31.7                | 100                     | 150     | 2       | 2.09   |
|                      | 160 | 30 | 2      | 1      | 117               | 100  |  | 4500               | 6000  | 7218ACM      | 44.1                | 100                     | 150     | 2       | 2.35   |
|                      | 160 | 30 | 2      | 1      | 117               | 100  |  | 4500               | 6000  | 7218AC       | 44.1                | 100                     | 150     | 2       | 2.11   |

# High-precision Angular Contact Ball Bearings



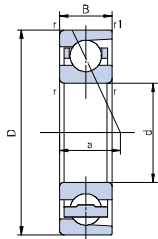
| Principal dimensions |     |    |        |        | Basic rating load |      |  | Limit rating speed |      | Designations | Contact points<br>a | Installation Dimensions |         |         | Weight |
|----------------------|-----|----|--------|--------|-------------------|------|--|--------------------|------|--------------|---------------------|-------------------------|---------|---------|--------|
| d                    | D   | B  | r12min | r34min | Cr                | Cor  |  | Grease             | Oil  |              |                     | da(max)                 | Da(max) | ra(max) |        |
| mm                   |     |    |        |        | KN                |      |  | r/min              |      |              | mm                  | mm                      |         |         | kg     |
| 95                   | 145 | 24 | 1.5    | 0.6    | 53.5              | 69.0 |  | 5200               | 6300 | 7019ACM      | 40                  | 93                      | 135     | 1.5     | 1.44   |
|                      | 170 | 32 | 2.1    | 1.1    | 139               | 120  |  | 6000               | 8500 | 7219CM       | 33.8                | 107                     | 158     | 2       | 3.20   |
|                      | 170 | 32 | 2.1    | 1.1    | 133               | 114  |  | 4300               | 5600 | 7219ACM      | 46.9                | 107                     | 158     | 2       | 2.97   |
|                      |     |    |        |        |                   |      |  |                    |      |              |                     |                         |         |         |        |
| 100                  | 150 | 24 | 1.5    | 0.6    | 76.7              | 77.0 |  | 4500               | 6000 | 7020AC       | 41.2                | 109                     | 141     | 1.5     | 1.25   |
|                      | 180 | 34 | 2.1    | 1.1    | 156               | 136  |  | 5600               | 8000 | 7220CM       | 35.8                | 112                     | 168     | 2       | 3.71   |
|                      | 180 | 34 | 2.1    | 1.1    | 148               | 130  |  | 4000               | 5300 | 7220ACM      | 49.6                | 112                     | 168     | 2       | 3.74   |
|                      | 180 | 34 | 2.1    | 1.1    | 148               | 130  |  | 4000               | 5300 | 7220AC       | 49.6                | 112                     | 168     | 2       | 3.25   |
|                      |     |    |        |        |                   |      |  |                    |      |              |                     |                         |         |         |        |
| 110                  | 170 | 21 | 1.5    | 1.5    | 76.7              | 82.0 |  | 4800               | 6800 | 7022AX2M     | 50.9                | 115                     | 165     | 1.5     | 1.86   |
|                      | 170 | 28 | 2      | 1      | 98.8              | 101  |  | 4000               | 5300 | 7022ACM      | 46.7                | 120                     | 160     | 2       | 2.41   |
|                      | 170 | 28 | 2      | 1      | 98.8              | 101  |  | 4000               | 5300 | 7022AC       | 46.7                | 120                     | 160     | 2       | 2.16   |
|                      | 200 | 38 | 2.1    | 1.1    | 185               | 171  |  | 5000               | 7100 | 7222CM       | 39.8                | 122                     | 188     | 2       | 5.03   |
|                      | 200 | 38 | 2.1    | 1.1    | 185               | 171  |  | 5000               | 7100 | 7222C        | 39.8                | 122                     | 188     | 2       | 4.07   |
|                      | 200 | 38 | 2.1    | 1.1    | 176               | 164  |  | 3600               | 4800 | 7222ACM      | 55.1                | 122                     | 188     | 2       | 4.81   |
|                      | 200 | 38 | 2.1    | 1.1    | 176               | 164  |  | 3600               | 4800 | 7222AC       | 55.1                | 122                     | 188     | 2       | 4.07   |
|                      |     |    |        |        |                   |      |  |                    |      |              |                     |                         |         |         |        |
| 120                  | 180 | 28 | 2      | 1      | 100               | 107  |  | 3600               | 5000 | 7024ACM      | 49                  | 130                     | 170     | 2       | 2.62   |
|                      | 180 | 28 | 2      | 1      | 100               | 107  |  | 3600               | 5000 | 7024AC       | 49                  | 130                     | 170     | 2       | 2.31   |
|                      | 215 | 40 | 2.1    | 1.1    | 190               | 184  |  | 3200               | 4500 | 7224ACM      | 59.1                | 132                     | 203     | 2       | 6.04   |
|                      |     |    |        |        |                   |      |  |                    |      |              |                     |                         |         |         |        |
| 130                  | 200 | 33 | 2      | 1      | 129               | 137  |  | 5400               | 6500 | 7026C        | 38.6                | 140                     | 190     | 2       | 3.33   |
|                      | 230 | 40 | 3      | 1.1    | 207               | 209  |  | 4400               | 5200 | 7226CM       | 44.1                | 144                     | 216     | 2.5     | 7.28   |
|                      | 230 | 40 | 3      | 1.1    | 196               | 200  |  | 2400               | 3200 | 7226ACM      | 62                  | 144                     | 216     | 2.5     | 7.26   |
|                      |     |    |        |        |                   |      |  |                    |      |              |                     |                         |         |         |        |
| 140                  | 210 | 33 | 2      | 1      | 125               | 137  |  | 3200               | 4300 | 7028AC       | 57.3                | 150                     | 200     | 2       | 3.46   |
|                      | 210 | 33 | 2      | 1      | 125               | 137  |  | 3200               | 4300 | 7028ACM      | 57.3                | 150                     | 200     | 2       | 4.14   |
|                      | 250 | 42 | 3      | 1.1    | 231               | 243  |  | 4200               | 5000 | 7228CM       | 47.1                | 154                     | 236     | 2.5     | 8.83   |
|                      | 250 | 42 | 3      | 1.1    | 220               | 237  |  | 2200               | 3000 | 7228ACM      | 66.5                | 154                     | 236     | 2.5     | 8.71   |
|                      |     |    |        |        |                   |      |  |                    |      |              |                     |                         |         |         |        |
| 150                  | 225 | 35 | 2.1    | 1.1    | 153               | 170  |  | 2400               | 3000 | 7030ACM      | 61.2                | 162                     | 213     | 2       | 4.80   |
|                      | 270 | 45 | 3      | 1.1    | 242               | 268  |  | 2000               | 2800 | 7230AC       | 71.5                | 164                     | 256     | 2.5     | 12.1   |
|                      |     |    |        |        |                   |      |  |                    |      |              |                     |                         |         |         |        |
| 160                  | 240 | 38 | 2.1    | 1.1    | 161               | 183  |  | 1800               | 2200 | 7032ACM      | 65.6                | 172                     | 228     | 2       | 5.95   |
|                      | 290 | 48 | 3      | 1.1    | 263               | 304  |  | 2900               | 3600 | 7232C        | 54.1                | 174                     | 276     | 2.5     | 14.5   |
|                      | 290 | 48 | 3      | 1.1    | 250               | 289  |  | 1900               | 2600 | 7232AC       | 76.5                | 174                     | 276     | 2.5     | 14.5   |

# High-precision Angular Contact Ball Bearings



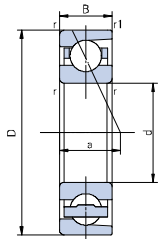
| Principal dimensions |     |    |        |        | Basic rating load |      |  | Limit rating speed |      | Designations | Contact points<br>a | Installation Dimensions |         |         | Weight |
|----------------------|-----|----|--------|--------|-------------------|------|--|--------------------|------|--------------|---------------------|-------------------------|---------|---------|--------|
| d                    | D   | B  | r12min | r34min | Cr                | Cor  |  | Grease             | Oil  |              |                     | da(max)                 | Da(max) | ra(max) |        |
| mm                   |     |    |        |        | KN                |      |  | r/min              |      |              | mm                  | mm                      |         |         | kg     |
| 170                  | 260 | 42 | 2.1    | 1.1    | 199               | 227  |  | 2000               | 2600 | 7034ACQ1     | 71.1                | 182                     | 248     | 2       | 8.27   |
|                      | 260 | 42 | 2.1    | 1.1    | 199               | 227  |  | 2000               | 2600 | 7034AC       | 71.1                | 182                     | 248     | 2       | 7.98   |
|                      | 310 | 52 | 4      | 1.5    | 321               | 389  |  | 2800               | 3400 | 7234C        | 58.2                | 188                     | 292     | 3       | 17.2   |
|                      | 310 | 52 | 4      | 1.5    | 306               | 371  |  | 1800               | 2400 | 7234AC       | 82                  | 188                     | 292     | 3       | 17.2   |
|                      |     |    |        |        |                   |      |  |                    |      |              |                     |                         |         |         |        |
| 180                  | 250 | 33 | 2      | 1      | 160               | 196  |  | 3200               | 4300 | 71936CM      | 45.3                | 192                     | 235     | 2       | 4.88   |
|                      | 320 | 52 | 4      | 1.5    | 333               | 418  |  | 2700               | 3200 | 7236C        | 59.5                | 198                     | 302     | 3       | 17.9   |
|                      | 320 | 52 | 4      | 1.5    | 317               | 399  |  | 1700               | 2200 | 7236AC       | 84.3                | 198                     | 302     | 3       | 17.9   |
|                      |     |    |        |        |                   |      |  |                    |      |              |                     |                         |         |         |        |
| 190                  | 290 | 46 | 2.1    | 1.1    | 215               | 263  |  | 1800               | 2400 | 7038AC       | 79                  | 202                     | 278     | 2       | 10.7   |
|                      | 340 | 55 | 4      | 1.5    | 257               | 430  |  | 1500               | 2000 | 7238AC       | 89.3                | 222                     | 324     | 3       | 22.4   |
|                      |     |    |        |        |                   |      |  |                    |      |              |                     |                         |         |         |        |
| 200                  | 310 | 51 | 2.1    | 1.1    | 264               | 331  |  | 1700               | 2200 | 7040AC       | 85                  | 212                     | 298     | 2       | 14.9   |
|                      | 310 | 51 | 2.1    | 1.1    | 264               | 331  |  | 1700               | 2200 | 7040ACN1     | 85                  | 212                     | 298     | 2       | 14.8   |
|                      | 360 | 58 | 4      | 1.5    | 363               | 487  |  | 2500               | 3000 | 7240C        | 66.5                | 218                     | 342     | 3       | 25.2   |
|                      | 360 | 58 | 4      | 1.5    | 345               | 462  |  | 1500               | 2000 | 7240AC       | 94.3                | 218                     | 342     | 3       | 25.2   |
|                      |     |    |        |        |                   |      |  |                    |      |              |                     |                         |         |         |        |
| 220                  | 400 | 65 | 4      | 1.5    | 423               | 605  |  | 1100               | 1600 | 7244AC       | 104.7               | 238                     | 382     | 3       | 36.1   |
|                      | 400 | 65 | 4      | 1.5    | 423               | 605  |  | 1100               | 1600 | 7244AC       | 104.7               | 238                     | 382     | 3       | 36.1   |
|                      |     |    |        |        |                   |      |  |                    |      |              |                     |                         |         |         |        |
| 240                  | 320 | 48 | 2.1    | 1.1    | 185               | 250  |  | 1000               | 1500 | 72948AC      | 89.3                | 252                     | 308     | 2       | 10.0   |
|                      |     |    |        |        |                   |      |  |                    |      |              |                     |                         |         |         |        |
| 260                  | 360 | 46 | 2.1    | 1.1    | 260               | 380  |  | 900                | 1400 | 71952AC      | 95.3                | 272                     | 348     | 2       | 13.8   |
| 280                  | 380 | 46 | 2.1    | 1.1    | 268               | 405  |  | 800                | 1300 | 71956AC      | 99.9                | 292                     | 368     | 2       | 15.7   |
|                      |     |    |        |        |                   |      |  |                    |      |              |                     |                         |         |         |        |
| 300                  | 460 | 74 | 4      | 1.5    | 410               | 690  |  | 950                | 1300 | 7060A        | 147                 | 318                     | 442     | 3       | 43     |
|                      |     |    |        |        |                   |      |  |                    |      |              |                     |                         |         |         |        |
| 320                  | 440 | 56 | 3      | 1.1    | 340               | 580  |  | 940                | 1400 | 71964AC      | 116                 | 334                     | 426     | 2.5     | 26.5   |
|                      | 480 | 74 | 4      | 1.5    | 416               | 700  |  | 800                | 1100 | 7064AC       | 130                 | 385                     | 445     | 3       | 47.5   |
|                      |     |    |        |        |                   |      |  |                    |      |              |                     |                         |         |         |        |
| 340                  | 460 | 56 | 3      | 1.1    | 330               | 575  |  | 900                | 1350 | 71968AC      | 126                 | 354                     | 446     | 2.5     | 24.5   |
|                      | 520 | 82 | 5      | 2      | 510               | 1050 |  | 800                | 1100 | 7068AC       | 141.3               | 360                     | 500     | 4       | 61.0   |
|                      |     |    |        |        |                   |      |  |                    |      |              |                     |                         |         |         |        |
| 360                  | 440 | 38 | 2.1    | 1.1    | 228               | 430  |  | 1800               | 2650 | 71872AC      | 112                 | 371                     | 430     | 2       | 12.5   |
|                      | 480 | 56 | 3      | 1.1    | 340               | 630  |  | 900                | 1300 | 71972AC      | 126                 | 374                     | 468     | 2.5     | 29.5   |
|                      | 480 | 56 | 3      | 1.1    | 330               | 620  |  | 850                | 1000 | 71972A       | 149                 | 374                     | 468     | 2.5     | 29.5   |

# High-speed Angular Contact Ball Bearings



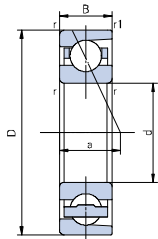
| Principal dimensions |     |    |      |       | Basic rating load |      | Limit rating speed |       | Designations | Contact points<br>a | Weight |
|----------------------|-----|----|------|-------|-------------------|------|--------------------|-------|--------------|---------------------|--------|
| d                    | D   | B  | rmin | r1min | Cr                | Cor  | Grease             | Oil   |              |                     |        |
| mm                   |     |    |      |       | KN                |      | r/min              |       |              |                     | kg     |
| 25                   | 42  | 9  | 0,3  | 0,15  | 7,85              | 5,4  | 34400              | 52300 | 71905CHA     | 9                   | 0,043  |
| 25                   | 42  | 9  | 0,3  | 0,15  | 7,84              | 5,4  | 29900              | 44800 | 71905ACHA    | 12,3                | 0,043  |
| 30                   | 47  | 9  | 0,3  | 0,15  | 8,5               | 6,25 | 29900              | 45500 | 71906CHA     | 9,7                 | 0,049  |
| 30                   | 47  | 9  | 0,3  | 0,15  | 7,85              | 5,95 | 26000              | 39000 | 71906ACHA    | 13,5                | 0,05   |
| 35                   | 55  | 10 | 0,6  | 0,3   | 12                | 9,15 | 25600              | 38900 | 71907CHA     | 11                  | 0,075  |
| 35                   | 55  | 10 | 0,6  | 0,3   | 11,5              | 9    | 22300              | 33400 | 71907ACHA    | 15,5                | 0,075  |
| 40                   | 62  | 12 | 0,6  | 0,3   | 15                | 11,5 | 22600              | 34400 | 71908CHA     | 12,8                | 0,109  |
| 40                   | 62  | 12 | 0,6  | 0,3   | 14,5              | 11,5 | 19700              | 29500 | 71908ACHA    | 17,9                | 0,11   |
| 45                   | 68  | 12 | 0,6  | 0,3   | 16                | 13,5 | 20400              | 31000 | 71909CHA     | 13,6                | 0,129  |
| 45                   | 68  | 12 | 0,6  | 0,3   | 15                | 12,5 | 17700              | 26600 | 71909ACHA    | 19,2                | 0,13   |
| 50                   | 72  | 12 | 0,6  | 0,3   | 17                | 15   | 18900              | 28700 | 71910CHA     | 14,2                | 0,13   |
| 50                   | 72  | 12 | 0,6  | 0,3   | 16                | 14,5 | 16400              | 24600 | 71910ACHA    | 20,2                | 0,132  |
| 55                   | 80  | 13 | 1    | 0,6   | 19                | 17,5 | 17100              | 26000 | 71911CHA     | 15,5                | 0,182  |
| 55                   | 80  | 13 | 1    | 0,6   | 18                | 16,5 | 14900              | 22300 | 71911ACHA    | 22,2                | 0,184  |
| 60                   | 85  | 13 | 1    | 0,6   | 19,5              | 19   | 15900              | 24200 | 71912CHA     | 16,2                | 0,195  |
| 60                   | 85  | 13 | 1    | 0,6   | 18,5              | 18   | 13800              | 20700 | 71912ACHA    | 23,4                | 0,198  |
| 65                   | 90  | 13 | 1    | 0,6   | 20                | 20,5 | 14900              | 22600 | 71913CHA     | 16,9                | 0,208  |
| 65                   | 90  | 13 | 1    | 0,6   | 19                | 19,5 | 13000              | 19400 | 71913ACHA    | 24,6                | 0,211  |
| 70                   | 100 | 16 | 1    | 0,6   | 28                | 27,5 | 13600              | 20600 | 71914CHA     | 19,4                | 0,338  |
| 70                   | 100 | 16 | 1    | 0,6   | 26,5              | 20,5 | 11800              | 17700 | 71914ACHA    | 27,8                | 0,341  |
| 75                   | 105 | 16 | 1    | 0,6   | 28,5              | 29,5 | 12800              | 19500 | 71915CHA     | 20,1                | 0,358  |
| 75                   | 105 | 16 | 1    | 0,6   | 27                | 28   | 11200              | 16700 | 71915ACHA    | 29                  | 0,355  |
| 80                   | 110 | 16 | 1    | 0,6   | 29                | 30,5 | 12200              | 18500 | 71916CHA     | 20,7                | 0,377  |
| 80                   | 110 | 16 | 1    | 0,6   | 27,5              | 29   | 10600              | 15800 | 71916ACHA    | 30,2                | 0,381  |

# High-speed Angular Contact Ball Bearings

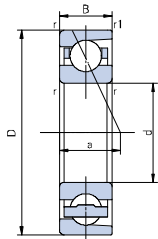


| Principal dimensions |     |    |      |       | Basic rating load |      | Limit rating speed |       | Designations | Contact points<br>a | Weight |
|----------------------|-----|----|------|-------|-------------------|------|--------------------|-------|--------------|---------------------|--------|
| d                    | D   | B  | rmin | r1min | Cr                | Cor  | Grease             | Oil   |              |                     |        |
| mm                   |     |    |      |       | KN                |      | r/min              |       |              |                     | kg     |
| 85                   | 120 | 18 | 1.1  | 0.6   | 39                | 40.5 | 11300              | 17100 | 71917CHA     | 22.7                | 0.534  |
| 85                   | 120 | 18 | 1.1  | 0.6   | 36.5              | 38.5 | 9800               | 14700 | 71917ACHA    | 32.9                | 0.541  |
| 90                   | 125 | 18 | 1.1  | 0.6   | 41.5              | 46   | 10700              | 16300 | 71918CHA     | 23.4                | 0.568  |
| 90                   | 125 | 18 | 1.1  | 0.6   | 39.5              | 43.5 | 9400               | 14000 | 71918ACHA    | 34.1                | 0.56   |
| 95                   | 130 | 18 | 1.1  | 0.6   | 42.5              | 48   | 10300              | 15600 | 71919CHA     | 24.1                | 0.597  |
| 95                   | 130 | 18 | 1.1  | 0.6   | 40                | 45.5 | 8900               | 13400 | 71919ACHA    | 35.2                | 0.603  |
| 100                  | 140 | 20 | 1.1  | 0.6   | 50                | 54   | 9600               | 14600 | 71920CHA     | 26.1                | 0.8    |
| 100                  | 140 | 20 | 1.1  | 0.6   | 47.5              | 51.5 | 8400               | 12500 | 71920ACHA    | 38                  | 0.808  |
| 105                  | 145 | 20 | 1.1  | 0.6   | 51                | 57   | 9200               | 14000 | 71921CHA     | 26.7                | 0.831  |
| 105                  | 145 | 20 | 1.1  | 0.6   | 48                | 54   | 8000               | 12000 | 71921ACHA    | 39.2                | 0.82   |
| 110                  | 150 | 20 | 1.1  | 0.6   | 52                | 59.5 | 8900               | 13500 | 71922CHA     | 27.4                | 0.867  |
| 110                  | 150 | 20 | 1.1  | 0.6   | 49                | 56   | 7700               | 11600 | 71922ACHA    | 40.3                | 0.877  |
| 120                  | 165 | 22 | 1.1  | 0.6   | 72                | 81   | 8100               | 12300 | 71924CHA     | 30.1                | 1.16   |
| 120                  | 165 | 22 | 1.1  | 0.6   | 67.5              | 77   | 7100               | 10600 | 71924ACHA    | 44.2                | 1.15   |
| 130                  | 180 | 24 | 1.5  | 1     | 78.5              | 91   | 7500               | 11300 | 71926CHA     | 32.8                | 1.5    |
| 130                  | 180 | 24 | 1.5  | 1     | 74                | 86   | 6500               | 9700  | 71926ACHA    | 48.1                | 1.54   |
| 140                  | 190 | 24 | 1.5  | 1     | 79.5              | 95.5 | 7000               | 10700 | 71928CHA     | 34.1                | 1.63   |
| 140                  | 190 | 24 | 1.5  | 1     | 75                | 90   | 6100               | 9100  | 71928ACHA    | 50.5                | 1.63   |
| 150                  | 210 | 28 | 2    | 1     | 102               | 122  | 6400               | 9800  | 71930CHA     | 38.1                | 2.96   |
| 150                  | 210 | 28 | 2    | 1     | 96.5              | 115  | 5600               | 8400  | 71930ACHA    | 56                  | 2.97   |
| 160                  | 220 | 28 | 2    | 1     | 106               | 133  | 6100               | 9300  | 71932CHA     | 39.4                | 3.1    |
| 160                  | 220 | 28 | 2    | 1     | 100               | 125  | 5300               | 7900  | 71932ACHA    | 58.3                | 3.12   |
| 170                  | 230 | 28 | 2    | 1     | 113               | 148  | 5800               | 8800  | 71934CHA     | 40.8                | 3.36   |
| 170                  | 230 | 28 | 2    | 1     | 106               | 140  | 5000               | 7500  | 71934ACHA    | 60.6                | 3.36   |



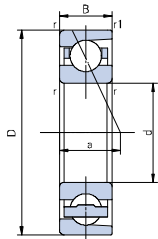
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# High-speed Angular Contact Ball Bearings



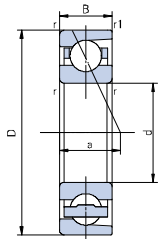
| Principal dimensions |     |    |      |       | Basic rating load |      | Limit rating speed |        | Designations | Contact points<br>a | Weight |
|----------------------|-----|----|------|-------|-------------------|------|--------------------|--------|--------------|---------------------|--------|
| d                    | D   | B  | rmin | r1min | Cr                | Cor  | Grease             | Oil    |              |                     |        |
| mm                   |     |    |      |       | KN                |      | r/min              |        |              |                     | kg     |
| 25                   | 47  | 12 | 0.6  | 0.3   | 11.5              | 7.5  | 32000              | 48700  | 7005CHA      | 10.8                | 0.078  |
| 25                   | 47  | 12 | 0.6  | 0.3   | 11                | 7    | 27800              | 41700  | 7005ACHA     | 14.4                | 0.077  |
| 25                   | 47  | 12 | 0.6  | 0.3   | 10.5              | 6.85 | 20900              | 27800  | 7005AHA      | 16.4                | 0.079  |
| 30                   | 55  | 13 | 1    | 0.6   | 15                | 10.5 | 27100              | 41200  | 7006CHA      | 12.2                | 0.114  |
| 30                   | 55  | 13 | 1    | 0.6   | 14.5              | 10   | 23600              | 35300  | 7006ACHA     | 16.5                | 0.114  |
| 30                   | 55  | 13 | 1    | 0.6   | 9.45              | 6.2  | 17700              | 23600  | 7006AHA      | 18.8                | 0.116  |
| 35                   | 62  | 14 | 1    | 0.6   | 19                | 13.5 | 23800              | 36100  | 7007CHA      | 13.5                | 0.151  |
| 35                   | 62  | 14 | 1    | 0.6   | 13                | 11.5 | 20700              | 31000  | 7007ACHA     | 18.3                | 0.151  |
| 35                   | 62  | 14 | 1    | 0.6   | 17.5              | 12.5 | 15500              | 20700  | 7007AHA      | 21                  | 0.153  |
| 40                   | 68  | 15 | 1    | 0.6   | 20.5              | 16   | 21300              | 32500  | 7008CHA      | 14.7                | 0.189  |
| 40                   | 68  | 15 | 1    | 0.6   | 19.5              | 15   | 18600              | 27800  | 7008ACHA     | 20.1                | 0.188  |
| 40                   | 68  | 15 | 1    | 0.6   | 18.5              | 14.5 | 13900              | 18600  | 7008AHA      | 23.1                | 0.191  |
| 45                   | 75  | 16 | 1    | 0.6   | 24.5              | 19.5 | 19200              | 29200  | 7009CHA      | 16                  | 0.238  |
| 45                   | 75  | 16 | 1    | 0.6   | 23                | 18.5 | 16700              | 25000  | 7009ACHA     | 22                  | 0.25   |
| 45                   | 75  | 16 | 1    | 0.6   | 22.5              | 18   | 12500              | 16700  | 7009AHA      | 25.3                | 0.241  |
| 50                   | 80  | 16 | 1    | 0.6   | 26                | 22   | 17700              | 27000  | 7010CHA      | 16.7                | 0.259  |
| 50                   | 80  | 16 | 1    | 0.6   | 24.5              | 21   | 15400              | 23100  | 7010ACHA     | 23.2                | 0.27   |
| 50                   | 80  | 16 | 1    | 0.6   | 23.5              | 20   | 11600              | 15400  | 7010AHA      | 26.8                | 0.262  |
| 55                   | 90  | 18 | 1.1  | 0.6   | 34                | 28.6 | 15900              | 24200  | 7011CHA      | 18.7                | 0.38   |
| 55                   | 90  | 18 | 1.1  | 0.6   | 32.5              | 27.5 | 13800              | 20700  | 7011ACHA     | 25.9                | 0.383  |
| 55                   | 90  | 18 | 1.1  | 0.6   | 31                | 26.5 | 10400              | 13800  | 7011AHA      | 29.9                | 0.385  |
| 60                   | 95  | 18 | 1.1  | 0.6   | 35                | 30.5 | 14900              | 22600  | 7012CHA      | 19.4                | 0.405  |
| 60                   | 95  | 18 | 1.1  | 0.6   | 33                | 29   | 13000              | 194000 | 7012ACHA     | 27.1                | 0.408  |
| 60                   | 95  | 18 | 1.1  | 0.6   | 32                | 28   | 9700               | 13000  | 7012AHA      | 31.4                | 0.41   |
| 65                   | 100 | 19 | 1.1  | 0.6   | 37                | 34.5 | 14000              | 21300  | 7013CHA      | 20                  | 0.435  |
| 65                   | 100 | 19 | 1.1  | 0.6   | 35                | 32.5 | 12200              | 18200  | 7013ACHA     | 28.2                | 0.455  |
| 65                   | 100 | 19 | 1.1  | 0.6   | 33.5              | 31.5 | 9100               | 12200  | 7013AHA      | 32.8                | 0.441  |

# High-speed Angular Contact Ball Bearings



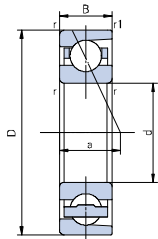
| Principal dimensions |     |    |      |       | Basic rating load |      | Limit rating speed |       | Designations | Contact points<br>a | Weight |
|----------------------|-----|----|------|-------|-------------------|------|--------------------|-------|--------------|---------------------|--------|
| d                    | D   | B  | rmin | r1min | Cr                | Cor  | Grease             | Oil   |              |                     |        |
| mm                   |     |    |      |       | KN                |      | r/min              |       |              |                     | kg     |
| 70                   | 110 | 20 | 1.1  | 0.6   | 47                | 43   | 12800              | 19500 | 7014CHA      | 22.1                | 0.606  |
| 70                   | 110 | 20 | 1.1  | 0.6   | 44.5              | 41   | 11200              | 16700 | 7014ACHA     | 31                  | 0.625  |
| 70                   | 110 | 20 | 1.1  | 0.6   | 42.5              | 39.5 | 8400               | 11200 | 7014AHA      | 36                  | 0.613  |
| 75                   | 115 | 20 | 1.1  | 0.6   | 48                | 45.5 | 12200              | 18500 | 7015CHA      | 22.7                | 0.643  |
| 75                   | 115 | 20 | 1.1  | 0.6   | 45.5              | 43.5 | 10600              | 15800 | 7015ACHA     | 32.1                | 0.652  |
| 75                   | 115 | 20 | 1.1  | 0.6   | 43.5              | 41.5 | 7900               | 10600 | 7015AHA      | 37.4                | 0.65   |
| 80                   | 125 | 22 | 1.1  | 0.6   | 58.5              | 55.5 | 11300              | 17100 | 7016CHA      | 24.7                | 0.855  |
| 80                   | 125 | 22 | 1.1  | 0.6   | 55.5              | 52.5 | 9800               | 14700 | 7016ACHA     | 34.9                | 0.88   |
| 80                   | 125 | 22 | 1.1  | 0.6   | 53.5              | 50.5 | 7400               | 9800  | 7016AHA      | 40.6                | 0.864  |
| 85                   | 130 | 22 | 1.1  | 0.6   | 60                | 58.5 | 10700              | 16300 | 7017CHA      | 25.4                | 0.898  |
| 85                   | 130 | 22 | 1.1  | 0.6   | 57                | 55.5 | 9400               | 14000 | 7017ACHA     | 36.1                | 0.904  |
| 85                   | 130 | 22 | 1.1  | 0.6   | 54.5              | 53.5 | 7000               | 9400  | 7017AHA      | 42                  | 0.907  |
| 90                   | 140 | 24 | 1.5  | 1     | 71.5              | 69   | 10000              | 15300 | 7018CHA      | 27.4                | 1.16   |
| 90                   | 140 | 24 | 1.5  | 1     | 68                | 65.5 | 8700               | 13100 | 7018ACHA     | 38.8                | 1.17   |
| 90                   | 140 | 24 | 1.5  | 1     | 65                | 63.5 | 6600               | 8700  | 7018AHA      | 45.2                | 1.18   |
| 95                   | 145 | 24 | 1.5  | 1     | 73.5              | 73   | 9600               | 14600 | 7019CHA      | 28.1                | 1.21   |
| 95                   | 145 | 24 | 1.5  | 1     | 69.5              | 69.5 | 8400               | 12500 | 7019ACHA     | 40                  | 1.41   |
| 95                   | 145 | 24 | 1.5  | 1     | 67                | 67   | 6300               | 8400  | 7019AHA      | 46.6                | 1.23   |
| 100                  | 150 | 24 | 1.5  | 1     | 75.5              | 77   | 9200               | 14000 | 7020CHA      | 28.7                | 1.27   |
| 100                  | 150 | 24 | 1.5  | 1     | 71                | 73.5 | 8000               | 12000 | 7020ACHA     | 41.1                | 1.45   |
| 100                  | 150 | 24 | 1.5  | 1     | 68.5              | 70.5 | 6000               | 8000  | 7020AHA      | 48.1                | 1.28   |
| 110                  | 170 | 28 | 2    | 1     | 106               | 104  | 8300               | 12500 | 7022CHA      | 32.7                | 1.94   |
| 110                  | 170 | 28 | 2    | 1     | 100               | 99   | 7200               | 10800 | 7022ACHA     | 46.6                | 2.26   |
| 110                  | 170 | 28 | 2    | 1     | 96.5              | 95.5 | 5400               | 7200  | 7022AHA      | 54.4                | 1.96   |
| 120                  | 180 | 28 | 2    | 1     | 112               | 117  | 7700               | 11700 | 7024CHA      | 34.1                | 2.09   |
| 120                  | 180 | 28 | 2    | 1     | 106               | 111  | 6700               | 10000 | 7024ACHA     | 49                  | 2.43   |
| 120                  | 180 | 28 | 2    | 1     | 102               | 107  | 5000               | 6700  | 7024AHA      | 57.3                | 2.12   |

# High-speed Angular Contact Ball Bearings



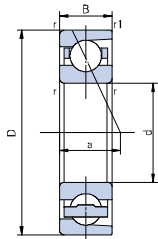
| Principal dimensions |     |    |      |       | Basic rating load |     | Limit rating speed |       | Designations | Contact points<br>a | Weight |
|----------------------|-----|----|------|-------|-------------------|-----|--------------------|-------|--------------|---------------------|--------|
| d                    | D   | B  | rmin | r1min | Cr                | Cor | Grease             | Oil   |              |                     |        |
| mm                   |     |    |      |       | KN                |     | r/min              |       |              |                     | kg     |
| 130                  | 200 | 33 | 2    | 1     | 129               | 137 | 7000               | 10700 | 7026CHA      | 38.6                | 3.22   |
| 130                  | 200 | 33 | 2    | 1     | 122               | 130 | 6100               | 9100  | 7026ACHA     | 55                  | 3.66   |
| 130                  | 200 | 33 | 2    | 1     | 117               | 125 | 4600               | 6100  | 7026AHA      | 64.1                | 3.26   |
| 140                  | 210 | 33 | 2    | 1     | 132               | 145 | 6600               | 10000 | 7028CHA      | 39.9                | 3.41   |
| 140                  | 210 | 33 | 2    | 1     | 125               | 138 | 5800               | 8600  | 7028ACHA     | 57.3                | 3.87   |
| 140                  | 210 | 33 | 2    | 1     | 120               | 133 | 4300               | 5800  | 7028AHA      | 67                  | 3.44   |
| 150                  | 225 | 35 | 2.1  | 1.1   | 151               | 168 | 6200               | 9400  | 7030CHA      | 42.6                | 4.15   |
| 150                  | 225 | 35 | 2.1  | 1.1   | 143               | 160 | 5400               | 8000  | 7030ACHA     | 61.2                | 4.69   |
| 150                  | 225 | 35 | 2.1  | 1.1   | 137               | 154 | 4000               | 5400  | 7030AHA      | 71.6                | 4.19   |
| 160                  | 240 | 38 | 2.1  | 1.1   | 171               | 193 | 5800               | 8800  | 7032CHA      | 45.8                | 5.11   |
| 160                  | 240 | 38 | 2.1  | 1.1   | 162               | 183 | 5000               | 7500  | 7032ACHA     | 65.6                | 5.71   |
| 160                  | 240 | 38 | 2.1  | 1.1   | 155               | 176 | 3800               | 5000  | 7032CAHA     | 76.7                | 5.16   |
| 170                  | 260 | 42 | 2.1  | 1.1   | 205               | 234 | 5400               | 8200  | 7034CHA      | 49.8                | 6.88   |
| 170                  | 260 | 42 | 2.1  | 1.1   | 193               | 223 | 4700               | 7000  | 7034ACHA     | 71.1                | 7.83   |
| 170                  | 260 | 42 | 2.1  | 1.1   | 186               | 214 | 3500               | 4700  | 7034AHA      | 83.1                | 6.94   |
| 180                  | 280 | 46 | 2.1  | 1.1   | 228               | 276 | 5000               | 7700  | 7036CHA      | 53.8                | 10.4   |
| 180                  | 280 | 46 | 2.1  | 1.1   | 216               | 262 | 4400               | 6600  | 7036ACHA     | 76.6                | 10.4   |
| 180                  | 280 | 46 | 2.1  | 1.1   | 207               | 252 | 3300               | 4400  | 7036AHA      | 89.4                | 9.17   |
| 190                  | 290 | 46 | 2.1  | 1.1   | 247               | 305 | 4800               | 7300  | 7038CHA      | 55.2                | 11.2   |
| 190                  | 290 | 46 | 2.1  | 1.1   | 233               | 291 | 4200               | 6300  | 7038ACHA     | 79                  | 11.2   |
| 190                  | 290 | 46 | 2.1  | 1.1   | 224               | 280 | 3200               | 4200  | 7038AHA      | 92.3                | 11.3   |
| 200                  | 310 | 51 | 2.1  | 1.1   | 265               | 340 | 4600               | 6900  | 7040CHA      | 59.7                | 13.6   |
| 200                  | 310 | 51 | 2.1  | 1.1   | 250               | 325 | 4000               | 5900  | 7040ACHA     | 85                  | 13.7   |
| 200                  | 310 | 51 | 2.1  | 1.1   | 240               | 310 | 3000               | 4000  | 7040AHA      | 99.1                | 13.7   |
|                      |     |    |      |       |                   |     |                    |       |              |                     |        |
|                      |     |    |      |       |                   |     |                    |       |              |                     |        |
|                      |     |    |      |       |                   |     |                    |       |              |                     |        |
|                      |     |    |      |       |                   |     |                    |       |              |                     |        |

# High-speed Angular Contact Ball Bearings



| Principal dimensions |     |    |      |       | Basic rating load |      | Limit rating speed |       | Designations | Contact points<br>a | Weight |
|----------------------|-----|----|------|-------|-------------------|------|--------------------|-------|--------------|---------------------|--------|
| d                    | D   | B  | rmin | r1min | Cr                | Cor  | Grease             | Oil   |              |                     |        |
| mm                   |     |    |      |       | KN                |      | r/min              |       |              |                     | kg     |
| 25                   | 52  | 15 | 1    | 0.6   | 16.5              | 10   | 29900              | 45500 | 7205CHA      | 12.7                | 0.127  |
| 25                   | 52  | 15 | 1    | 0.6   | 16                | 10   | 26000              | 39000 | 7205ACHA     | 16.5                | 0.13   |
| 25                   | 52  | 15 | 1    | 0.6   | 15.5              | 9.45 | 19500              | 26000 | 7205AHA      | 18.6                | 0.129  |
| 30                   | 62  | 16 | 1    | 0.6   | 23                | 14.7 | 25000              | 38100 | 7206CHA      | 14.2                | 0.194  |
| 30                   | 62  | 16 | 1    | 0.6   | 22                | 14   | 21800              | 32700 | 7206ACHA     | 18.7                | 0.194  |
| 30                   | 62  | 16 | 1    | 0.6   | 21.5              | 13.5 | 16400              | 21800 | 7206AHA      | 21.3                | 0.197  |
| 35                   | 72  | 17 | 1.1  | 0.6   | 30.5              | 20   | 21500              | 32800 | 7207CHA      | 15.7                | 0.28   |
| 35                   | 72  | 17 | 1.1  | 0.6   | 29                | 19   | 18700              | 28100 | 7207ACHA     | 21                  | 0.277  |
| 35                   | 72  | 17 | 1.1  | 0.6   | 28                | 18.5 | 14100              | 18700 | 7207AHA      | 23.9                | 0.284  |
| 40                   | 80  | 18 | 1.1  | 0.6   | 36.5              | 25   | 19200              | 29200 | 7208CHA      | 17                  | 0.366  |
| 40                   | 80  | 18 | 1.1  | 0.6   | 34.5              | 24   | 16700              | 25000 | 7208ACHA     | 23                  | 0.362  |
| 40                   | 80  | 18 | 1.1  | 0.6   | 33.5              | 23.5 | 12500              | 16700 | 7208AHA      | 26.3                | 0.37   |
| 45                   | 85  | 19 | 1.1  | 0.6   | 41                | 28.5 | 17700              | 27000 | 7209CHA      | 18.2                | 0.406  |
| 45                   | 85  | 19 | 1.1  | 0.6   | 39                | 27.5 | 15400              | 23100 | 7209ACHA     | 24.7                | 0.402  |
| 45                   | 85  | 19 | 1.1  | 0.6   | 37.5              | 26.5 | 11600              | 15400 | 7209AHA      | 28.3                | 0.41   |
| 50                   | 90  | 20 | 1.1  | 0.6   | 43                | 31.5 | 16500              | 25000 | 7210CHA      | 19.4                | 0.457  |
| 50                   | 90  | 20 | 1.1  | 0.6   | 41                | 30.5 | 14300              | 21500 | 7210ACHA     | 26.3                | 0.453  |
| 50                   | 90  | 20 | 1.1  | 0.6   | 39.5              | 29.5 | 10800              | 14300 | 7210AHA      | 30.2                | 0.462  |
| 55                   | 100 | 21 | 1.5  | 1     | 53                | 40   | 14900              | 22600 | 7211CHA      | 20.9                | 0.601  |
| 55                   | 100 | 21 | 1.5  | 1     | 50.5              | 38   | 13000              | 19400 | 7211ACHA     | 28.6                | 0.596  |
| 55                   | 100 | 21 | 1.5  | 1     | 49                | 37   | 9700               | 13000 | 7211AHA      | 32.9                | 0.609  |
| 60                   | 110 | 22 | 1.5  | 1     | 64                | 49   | 13600              | 20600 | 7212CHA      | 22.4                | 0.78   |
| 60                   | 110 | 22 | 1.5  | 1     | 61                | 47   | 11800              | 17700 | 7212ACHA     | 30.8                | 0.773  |
| 60                   | 110 | 22 | 1.5  | 1     | 59                | 45.5 | 8900               | 11800 | 7212AHA      | 35.5                | 0.789  |
| 65                   | 120 | 23 | 1.5  | 1     | 73                | 58.5 | 12500              | 19000 | 7213CHA      | 23.9                | 1.01   |
| 65                   | 120 | 23 | 1.5  | 1     | 69.5              | 56   | 10900              | 16300 | 7213ACHA     | 33.1                | 1      |
| 65                   | 120 | 23 | 1.5  | 1     | 67.5              | 54   | 8200               | 10900 | 7213AHA      | 38.2                | 1.02   |

# High-speed Angular Contact Ball Bearings

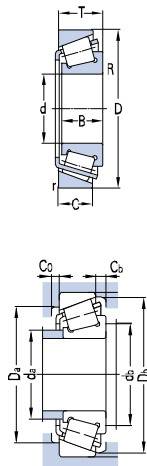


| Principal dimensions |     |    |      |       | Basic rating load |      | Limit rating speed |       | Designations | Contact points<br>a | Weight |
|----------------------|-----|----|------|-------|-------------------|------|--------------------|-------|--------------|---------------------|--------|
| d                    | D   | B  | rmin | r1min | Cr                | Cor  | Grease             | Oil   |              |                     |        |
| mm                   |     |    |      |       | KN                |      | r/min              |       |              |                     | kg     |
| 70                   | 125 | 24 | 1.5  | 1     | 79.5              | 43   | 11800              | 18000 | 7214CHA      | 25.1                | 1.09   |
| 70                   | 125 | 24 | 1.5  | 1     | 76                | 49.5 | 10300              | 15400 | 7214ACHA     | 34.7                | 1.08   |
| 70                   | 125 | 24 | 1.5  | 1     | 73                | 38   | 7700               | 10300 | 7214AHA      | 40.1                | 1.1    |
| 75                   | 130 | 25 | 1.5  | 1     | 83                | 70   | 11300              | 17100 | 7215CHA      | 26.2                | 1.19   |
| 75                   | 130 | 25 | 1.5  | 1     | 79                | 66.5 | 9800               | 14700 | 7215ACHA     | 36.4                | 1.18   |
| 75                   | 130 | 25 | 1.5  | 1     | 76                | 64.5 | 7400               | 9800  | 7215AHA      | 42.1                | 1.2    |
| 80                   | 140 | 26 | 2    | 1     | 93                | 77.5 | 10500              | 16000 | 7216CHA      | 27.7                | 1.43   |
| 80                   | 140 | 26 | 2    | 1     | 88.5              | 74   | 9100               | 13700 | 7216ACHA     | 38.6                | 1.42   |
| 80                   | 140 | 26 | 2    | 1     | 85.5              | 71.5 | 6900               | 9100  | 7216AHA      | 44.8                | 1.45   |
| 85                   | 150 | 28 | 2    | 1     | 107               | 90.5 | 9800               | 14900 | 7217CHA      | 29.7                | 1.79   |
| 85                   | 150 | 28 | 2    | 1     | 102               | 86.5 | 8600               | 12800 | 7217ACHA     | 41.4                | 1.79   |
| 85                   | 150 | 28 | 2    | 1     | 98.5              | 83.5 | 6400               | 8600  | 7217AHA      | 47.9                | 1.8    |
| 90                   | 160 | 30 | 2    | 1     | 123               | 105  | 9200               | 14000 | 7218CHA      | 31.7                | 2.2    |
| 90                   | 160 | 30 | 2    | 1     | 117               | 100  | 8000               | 12000 | 7218ACHA     | 44.1                | 2.31   |
| 90                   | 160 | 30 | 2    | 1     | 113               | 96.5 | 6000               | 8000  | 7218AHA      | 51.1                | 2.23   |
| 95                   | 170 | 32 | 2.1  | 1.1   | 133               | 112  | 8700               | 13300 | 7219CHA      | 33.7                | 2.64   |
| 95                   | 170 | 32 | 2.1  | 1.1   | 127               | 107  | 7600               | 11400 | 7219ACHA     | 46.9                | 2.63   |
| 95                   | 170 | 32 | 2.1  | 1.1   | 122               | 103  | 5700               | 7600  | 7219AHA      | 54.2                | 2.67   |
| 100                  | 180 | 34 | 2.1  | 1.1   | 149               | 127  | 8300               | 12500 | 7220CHA      | 35.7                | 3.18   |
| 100                  | 180 | 34 | 2.1  | 1.1   | 142               | 121  | 7200               | 10800 | 7220ACHA     | 49.6                | 3.16   |
| 100                  | 180 | 34 | 2.1  | 1.1   | 137               | 117  | 5400               | 7200  | 7220AHA      | 57.4                | 3.21   |
| 105                  | 190 | 36 | 2.1  | 1.1   | 162               | 143  | 7800               | 11900 | 7221CHA      | 37.7                | 3.78   |
| 105                  | 190 | 36 | 2.1  | 1.1   | 155               | 137  | 6800               | 10200 | 7221ACHA     | 52.4                | 3.77   |
| 105                  | 190 | 36 | 2.1  | 1.1   | 150               | 132  | 5100               | 6800  | 7221AHA      | 60.6                | 3.82   |
| 110                  | 200 | 38 | 2.1  | 1.1   | 176               | 160  | 7500               | 11300 | 7222CHA      | 39.8                | 4.45   |
| 110                  | 200 | 38 | 2.1  | 1.1   | 168               | 153  | 6500               | 9700  | 7222ACHA     | 65.1                | 4.45   |
| 110                  | 200 | 38 | 2.1  | 1.1   | 162               | 148  | 4900               | 6500  | 7222AHA      | 63.7                | 4.49   |

## 63



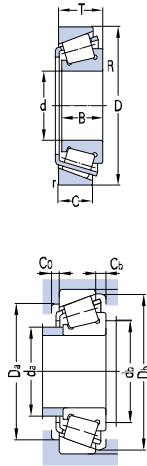
# Tapered Roller Bearings



| Principal dimensions |    |       |      |      |                     |                    |                     |                    | Basic rating load |      | Limit rating speed |       |  | Designations | Installation Dimensions |         |         |         |         |         |         |      | Calculation Factor |                |    |       | Weight |
|----------------------|----|-------|------|------|---------------------|--------------------|---------------------|--------------------|-------------------|------|--------------------|-------|--|--------------|-------------------------|---------|---------|---------|---------|---------|---------|------|--------------------|----------------|----|-------|--------|
| d                    | D  | T     | B    | C    | R <sub>radial</sub> | R <sub>axial</sub> | r <sub>radial</sub> | r <sub>axial</sub> | Cr                | Cor  | Grease             | Oil   |  |              | da(max)                 | db(min) | Da(min) | Da(max) | Db(min) | Ca(min) | Cb(min) | e    | Y                  | Y <sub>0</sub> | a  |       |        |
| mm                   |    |       |      |      |                     |                    |                     |                    | KN                |      | r/min              |       |  |              | mm                      |         |         |         |         |         |         |      | KN                 |                |    |       | kg     |
| 20                   | 42 | 15    | 15   | 12   | 0.6                 | 0.6                | 0.6                 | 0.6                | 23                | 33   | 8500               | 12000 |  | 32004        | 25                      | 25      | 37      | 36      | 39      | 2       | 3       | 0.37 | 1.6                | 0.9            | 10 | 0.105 |        |
|                      | 47 | 15    | 14   | 12   | 1                   | 1                  | 1                   | 1                  | 30.5              | 29.7 | 8000               | 11000 |  | 30204X2      | 28                      | 24      | 40      | 43      | 44      | 2.5     | 3       | 0.35 | 1.7                | 0.96           | 11 | 0.123 |        |
|                      | 47 | 15.25 | 14   | 12   | 1                   | 1                  | 1                   | 1                  | 26.8              | 26.9 | 8000               | 11000 |  | 30204        | 27                      | 26      | 40      | 41      | 43      | 2.5     | 3.3     | 0.35 | 1.7                | 0.96           | 11 | 0.121 |        |
|                      | 47 | 19.25 | 18   | 15   | 1                   | 1                  | 1                   | 1                  | 27.5              | 31   | 7500               | 10000 |  | 32204        | 26                      | 24      | 38      | 43      | 44      | 2       | 4.3     | 0.33 | 1.8                | 1              | 12 | 0.158 |        |
| 25                   | 47 | 15    | 15   | 11.5 | 0.6                 | 0.6                | 0.6                 | 0.6                | 26                | 39.5 | 8000               | 11000 |  | 32005        | 30                      | 30      | 42      | 40      | 44      | 3       | 3.5     | 0.43 | 1.4                | 0.8            | 12 | 0.43  |        |
|                      | 52 | 16.25 | 15   | 13   | 1                   | 1                  | 1                   | 1                  | 32                | 34   | 7500               | 9500  |  | 30205        | 31                      | 31      | 44      | 46      | 49      | 2       | 3.3     | 0.37 | 1.6                | 0.88           | 12 | 0.160 |        |
|                      | 52 | 19.25 | 18   | 16   | 1                   | 1                  | 1                   | 1                  | 40.5              | 46   | 7000               | 9500  |  | 32205        | 31                      | 31      | 44      | 48      | 50      | 2       | 3.3     | 0.36 | 1.7                | 0.92           | 13 | 0.199 |        |
|                      | 52 | 23.75 | 22.5 | 13   | 5.5                 | 5.5                | 1                   | 1                  | 32                | 35   | 7500               | 9500  |  | 30205X2      | 32                      | 26      | 43      | 48      | 49      | 2       | 11      | 0.37 | 1.6                | 0.88           | 12 | 0.200 |        |
| 30                   | 55 | 17    | 17   | 13   | 1                   | 1                  | 1                   | 1                  | 36                | 47   | 6700               | 9000  |  | 32006        | 35                      | 36      | 48      | 49      | 52      | 3       | 4       | 0.43 | 1.4                | 0.8            | 13 | 0.171 |        |
|                      | 62 | 17.25 | 16   | 14   | 1                   | 1                  | 1                   | 1                  | 41                | 44   | 6300               | 8500  |  | 30206        | 37                      | 36      | 53      | 56      | 58      | 3       | 4.5     | 0.37 | 1.6                | 0.88           | 14 | 0.230 |        |
| 35                   | 62 | 21.25 | 20   | 17   | 1                   | 1                  | 1                   | 1                  | 55                | 65   | 6300               | 8500  |  | 32206        | 36                      | 36      | 52      | 56      | 58      | 2       | 4.3     | 0.37 | 1.6                | 0.88           | 15 | 0.356 |        |
| 35                   | 62 | 18    | 18   | 14   | 1                   | 1                  | 1                   | 1                  | 42                | 52   | 6000               | 8000  |  | 32007        | 40                      | 41      | 54      | 56      | 59      | 4       | 4       | 0.45 | 1.3                | 0.73           | 15 | 0.384 |        |
|                      | 72 | 18.25 | 17   | 15   | 1.5                 | 1.5                | 1.5                 | 1.5                | 50.5              | 55   | 5300               | 7000  |  | 30207        | 44                      | 42      | 62      | 65      | 67      | 3       | 3.3     | 0.37 | 1.6                | 0.88           | 15 | 0.318 |        |
|                      | 72 | 24.25 | 23   | 19   | 1.5                 | 1.5                | 1.5                 | 1.5                | 66                | 80   | 5300               | 7000  |  | 32207E       | 42                      | 42      | 61      | 65      | 68      | 3       | 5.3     | 0.37 | 1.6                | 0.88           | 17 | 0.465 |        |
|                      | 72 | 24.25 | 23   | 19   | 1.5                 | 1.5                | 1.5                 | 1.5                | 66                | 80   | 5300               | 7000  |  | 32207        | 42                      | 42      | 61      | 65      | 68      | 2       | 5.3     | 0.37 | 1.6                | 0.88           | 17 | 0.452 |        |
|                      | 68 | 19    | 19   | 14.5 | 1                   | 1                  | 1                   | 1                  | 58.5              | 79.5 | 5300               | 7000  |  | 32008        | 47                      | 44      | 59      | 64      | 66      | 3       | 4.5     | 0.38 | 1.6                | 0.87           | 15 | 0.297 |        |
| 45                   | 80 | 19.75 | 18   | 16   | 1.5                 | 1.5                | 1.5                 | 1.5                | 66                | 73   | 4800               | 6300  |  | 30208        | 49                      | 47      | 69      | 73      | 75      | 3       | 3.8     | 0.37 | 1.6                | 0.88           | 17 | 0.430 |        |
|                      | 80 | 24.75 | 23   | 19   | 1.5                 | 1.5                | 1.5                 | 1.5                | 79                | 93   | 4800               | 6300  |  | 32208        | 48                      | 47      | 68      | 73      | 76      | 3       | 5.8     | 0.37 | 1.6                | 0.88           | 18 | 0.561 |        |
|                      | 75 | 20    | 20   | 15.5 | 1                   | 1                  | 1                   | 1                  | 57.5              | 80   | 4800               | 6300  |  | 32009        | 52                      | 49      | 65      | 71      | 73      | 3       | 6       | 0.39 | 1.5                | 0.84           | 17 | 0.343 |        |
| 50                   | 85 | 20.75 | 19   | 16   | 1.5                 | 1.5                | 1.5                 | 1.5                | 70.5              | 83   | 4500               | 6000  |  | 30209        | 53                      | 52      | 74      | 78      | 80      | 3       | 5       | 0.4  | 1.5                | 0.81           | 18 | 0.464 |        |
|                      | 85 | 24.75 | 23   | 19   | 1.5                 | 1.5                | 1.5                 | 1.5                | 84.5              | 105  | 4500               | 6000  |  | 32209        | 53                      | 52      | 73      | 78      | 81      | 3       | 5.8     | 0.4  | 1.5                | 0.81           | 20 | 0.576 |        |
|                      | 85 | 24.75 | 23.5 | 20   | 1.5                 | 1.5                | 1.5                 | 1.5                | 59.5              | 72   | 4500               | 6000  |  | 32209X2A     | 53                      | 53      | 69      | 78      | 78      | 3       | 4.8     | 0.4  | 1.5                | 0.83           | 19 | 0.621 |        |
| 55                   | 80 | 20    | 20   | 15.5 | 1                   | 1                  | 1                   | 1                  | 60                | 86.5 | 4500               | 6000  |  | 32010        | 57                      | 54      | 70      | 76      | 78      | 4       | 4.5     | 0.42 | 1.4                | 0.78           | 18 | 0.381 |        |
|                      | 80 | 22    | 20   | 17.5 | 4                   | 4                  | 1.5                 | 1.5                | 60                | 86   | 4500               | 6000  |  | 32010X2A     | 57                      | 64      | 70      | 73      | 78      | 4       | 4.5     | 0.42 | 1.4                | 0.78           | 19 | 0.388 |        |
|                      | 83 | 20.5  | 20.5 | 15.5 | 4                   | 4                  | 1                   | 1                  | 66                | 91   | 4500               | 6000  |  | 32010X3A     | 57                      | 64      | 73      | 79      | 80      | 4       | 5       | 0.36 | 1.7                | 0.92           | 17 | 0.430 |        |
|                      | 90 | 21.75 | 20   | 17   | 1.5                 | 1.5                | 1.5                 | 1.5                | 72.5              | 74   | 4300               | 5600  |  | 30210        | 58                      | 57      | 79      | 83      | 86      | 3       | 5       | 0.42 | 1.4                | 0.79           | 20 | 0.550 |        |
|                      | 90 | 24.75 | 23   | 19   | 1.5                 | 1.5                | 1.5                 | 1.5                | 88                | 110  | 4000               | 5600  |  | 32210        | 57                      | 57      | 78      | 83      | 86      | 3       | 5.8     | 0.42 | 1.4                | 0.79           | 21 | 0.654 |        |
| 90                   | 25 | 23    | 19   | 1.3  | 1.3                 | 1.3                | 1.3                 | 1.3                | 62                | 77   | 4300               | 5600  |  | 32210A       | 60                      | 59      | 76      | 90      | 86      | 3       | 6       | 0.42 | 1.4                | 0.78           | 21 | 0.612 |        |
|                      | 90 | 23    | 23   | 17.5 | 1.5                 | 1.5                | 1.5                 | 1.5                | 77                | 111  | 4000               | 5300  |  | 32011        | 64                      | 63      | 79      | 83      | 88      | 4.5     | 5.5     | 0.41 | 1.5                | 0.81           | 20 | 0.564 |        |

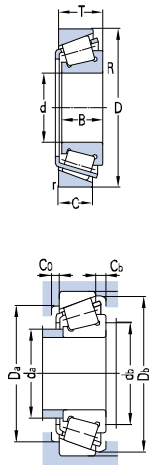


# Tapered Roller Bearings



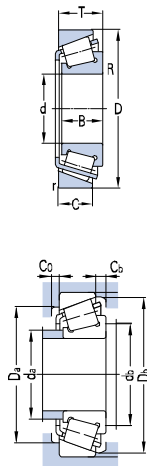
| Principal dimensions |     |       |    |      |                     |                    |                     |                    | Basic rating load |      | Limit rating speed |      |  | Designations | Installation Dimensions |         |         |         |                      |         |                      |      | Calculation Factor |                |    |       | Weight |
|----------------------|-----|-------|----|------|---------------------|--------------------|---------------------|--------------------|-------------------|------|--------------------|------|--|--------------|-------------------------|---------|---------|---------|----------------------|---------|----------------------|------|--------------------|----------------|----|-------|--------|
| d                    | D   | T     | B  | C    | R <sub>radial</sub> | R <sub>axial</sub> | r <sub>radial</sub> | r <sub>axial</sub> | Cr                | Cor  | Grease             | Oil  |  |              | da(max)                 | db(min) | Da(min) | Da(max) | D <sub>b</sub> (min) | Ca(min) | C <sub>b</sub> (min) | e    | Y                  | Y <sub>0</sub> | a  |       |        |
| mm                   |     |       |    |      |                     |                    |                     |                    | KN                |      | r/min              |      |  | mm           |                         |         |         |         |                      |         | KN                   |      |                    |                | kg |       |        |
| 55                   | 100 | 22,75 | 21 | 18   | 2                   | 2                  | 1.5                 | 1.5                | 93                | 110  | 3800               | 5000 |  | 30211        | 64                      | 64      | 88      | 91      | 95                   | 4       | 5                    | 0.4  | 1.5                | 0.81           | 21 | 0.713 |        |
|                      | 100 | 26,75 | 25 | 21   | 2                   | 2                  | 1.5                 | 1.5                | 108               | 133  | 3800               | 5000 |  | 32211        | 62                      | 64      | 87      | 91      | 95                   | 4       | 5.7                  | 0.4  | 1.5                | 0.81           | 22 | 0.878 |        |
| 60                   | 85  | 17    | 16 | 14   | 1                   | 1                  | 1                   | 1                  | 42,5              | 67,5 | 3900               | 5100 |  | 32912X2A     | 65                      | 68      | 76      | 81      | 79                   | 4       | 3                    | 0.38 | 1.6                | 0.87           | 17 | 0.277 |        |
|                      | 95  | 23    | 23 | 17,5 | 1,5                 | 1,5                | 1,5                 | 1,5                | 78,5              | 112  | 3800               | 5000 |  | 32012        | 68                      | 68      | 83      | 88      | 92                   | 5       | 5,5                  | 0.4  | 1,4                | 0.77           | 21 | 0.597 |        |
|                      | 110 | 23,75 | 22 | 19   | 2                   | 2                  | 1.5                 | 1.5                | 104               | 124  | 3400               | 4500 |  | 30212        | 69                      | 69      | 96      | 101     | 103                  | 4       | 5                    | 0.4  | 1.5                | 0.81           | 23 | 0.923 |        |
|                      | 110 | 29,75 | 28 | 24   | 2                   | 2                  | 1.5                 | 1.5                | 133               | 170  | 3400               | 4500 |  | 32212        | 69                      | 68      | 95      | 101     | 104                  | 4       | 5,8                  | 0.4  | 1.5                | 0.81           | 25 | 1,26  |        |
| 65                   | 100 | 23    | 23 | 17,5 | 1,5                 | 1,5                | 1,5                 | 1,5                | 82,5              | 128  | 3400               | 4500 |  | 32013        | 72                      | 72      | 90      | 93      | 97                   | 4       | 5,5                  | 0.46 | 1,3                | 0.7            | 22 | 0.612 |        |
|                      | 100 | 23,3  | 22 | 19   | 1,5                 | 1,5                | 1,5                 | 1,5                | 81                | 116  | 3400               | 4500 |  | 32013X2      | 72                      | 72      | 90      | 93      | 97                   | 4       | 5,5                  | 0.35 | 1,7                | 0.94           | 20 | 0.629 |        |
|                      | 120 | 24,75 | 23 | 20   | 2                   | 2                  | 1,5                 | 1,5                | 122               | 147  | 3000               | 4000 |  | 30213        | 77                      | 74      | 106     | 111     | 114                  | 4       | 5                    | 0.4  | 1,5                | 0.81           | 24 | 1,14  |        |
|                      | 120 | 32,75 | 31 | 27   | 2                   | 2                  | 1,5                 | 1,5                | 151               | 192  | 3000               | 4000 |  | 32213        | 75                      | 74      | 104     | 111     | 115                  | 4       | 5,8                  | 0.4  | 1,5                | 0.81           | 28 | 1.58  |        |
|                      | 120 | 33    | 31 | 27   | 1,8                 | 1,8                | 1,8                 | 1,8                | 130               | 163  | 3000               | 4000 |  | 32213A       | 75                      | 74      | 104     | 111     | 115                  | 3,5     | 6                    | 0.37 | 1,6                | 0.89           | 26 | 1.50  |        |
|                      |     |       |    |      |                     |                    |                     |                    |                   |      |                    |      |  |              |                         |         |         |         |                      |         |                      |      |                    |                |    |       |        |
| 70                   | 100 | 20    | 20 | 16   | 1                   | 1                  | 1                   | 1                  | 70,5              | 114  | 3000               | 4000 |  | 32914        | 76                      | 76      | 90      | 96      | 96                   | 5       | 4                    | 0.32 | 1.9                | 1.05           | 18 | 0.475 |        |
|                      | 100 | 20    | 19 | 16   | 1                   | 1                  | 1                   | 1                  | 60,5              | 97   | 3000               | 4000 |  | 32914X2A     | 77                      | 74      | 90      | 96      | 96                   | 5       | 4                    | 0.36 | 1,7                | 0.92           | 19 | 0.477 |        |
|                      | 110 | 25    | 25 | 19   | 1,5                 | 1,5                | 1,5                 | 1,5                | 106               | 163  | 3000               | 4000 |  | 32014        | 93                      | 78      | 112     | 103     | 125                  | 5       | 6                    | 0.43 | 1,4                | 0.76           | 26 | 0.972 |        |
|                      | 125 | 26,25 | 24 | 21   | 2                   | 2                  | 1,5                 | 1,5                | 119               | 142  | 3000               | 4000 |  | 30214        | 81                      | 69      | 110     | 116     | 118                  | 4       | 5,3                  | 0.42 | 1,4                | 0.79           | 26 | 1,29  |        |
|                      | 125 | 33,25 | 31 | 27   | 2                   | 2                  | 1,5                 | 1,5                | 170               | 227  | 2800               | 3800 |  | 32214        | 79                      | 79      | 106     | 118     | 120                  | 4       | 6,3                  | 0.42 | 1,4                | 0.79           | 29 | 1.66  |        |
|                      | 130 | 57    | 56 | 35   | 10,5                | 11                 | 1,5                 | 1,5                | 250               | 345  | 3000               | 4000 |  | 30214X3      | 82                      | 71      | 109     | 123     | 124                  | 5       | 22                   | 0.33 | 1,8                | 0.99           | 30 | 2.92  |        |
| 75                   | 115 | 25    | 25 | 19   | 1,5                 | 1,5                | 1,5                 | 1,5                | 104               | 160  | 3000               | 4000 |  | 32015        | 84                      | 83      | 100     | 108     | 112                  | 6       | 6                    | 0.46 | 1,3                | 0.72           | 25 | 0.922 |        |
|                      | 130 | 27,25 | 25 | 22   | 2                   | 2                  | 1,5                 | 1,5                | 139               | 175  | 2800               | 3800 |  | 30215        | 85                      | 84      | 115     | 121     | 125                  | 4,5     | 5,3                  | 0.44 | 1,4                | 0.76           | 28 | 1.40  |        |
|                      | 130 | 33,25 | 31 | 27   | 2                   | 2                  | 1,5                 | 1,5                | 173               | 231  | 2600               | 3600 |  | 32215        | 84                      | 84      | 115     | 126     | 126                  | 4,5     | 6,3                  | 0.44 | 1,4                | 0.76           | 30 | 1.76  |        |
|                      | 130 | 33,5  | 31 | 27   | 1,8                 | 1,8                | 1,8                 | 1,8                | 139               | 184  | 2600               | 3600 |  | 32215A       | 87                      | 83      | 110     | 125     | 123                  | 4,5     | 6,5                  | 0.41 | 1,5                | 0.81           | 29 | 1.74  |        |
| 80                   | 110 | 20    | 19 | 16   | 1                   | 1                  | 1                   | 1                  | 63                | 105  | 2700               | 3700 |  | 32916X2A     | 86                      | 88      | 100     | 106     | 106                  | 5       | 6                    | 0.32 | 1.83               | 1              | 20 | 0.500 |        |
|                      | 125 | 29    | 29 | 22   | 1,5                 | 1,5                | 1,5                 | 1,5                | 139               | 219  | 2600               | 3600 |  | 32016        | 90                      | 88      | 109     | 118     | 121                  | 6       | 7                    | 0.42 | 1,4                | 0.78           | 27 | 1.26  |        |
|                      | 140 | 28,25 | 26 | 22   | 2,5                 | 2,5                | 2                   | 2                  | 146               | 178  | 2400               | 3400 |  | 30216        | 90                      | 90      | 124     | 130     | 133                  | 4,5     | 6,3                  | 0.42 | 1,4                | 0.79           | 29 | 1.56  |        |
|                      | 140 | 35,25 | 33 | 28   | 2,5                 | 2,5                | 2                   | 2                  | 198               | 263  | 2400               | 3400 |  | 32216        | 89                      | 90      | 122     | 130     | 135                  | 5       | 7,3                  | 0.42 | 1,4                | 0.79           | 32 | 2.19  |        |
|                      | 140 | 35,25 | 33 | 28   | 5,5                 | 5,5                | 2                   | 2                  | 198               | 263  | 2400               | 3400 |  | 32216/YA6—1  | 91                      | 81      | 120     | 132     | 134                  | 6       | 7,3                  | 0.42 | 1,4                | 0.79           | 32 | 2.19  |        |
|                      | 140 | 35,5  | 33 | 28   | 2,3                 | 2,3                | 2,3                 | 2,3                | 162               | 216  | 2400               | 3400 |  | 32216A       | 94                      | 90      | 119     | 140     | 132                  | 4,5     | 7,5                  | 0.4  | 1,5                | 0.82           | 31 | 2.13  |        |
| 85                   | 130 | 29    | 29 | 22   | 1,5                 | 1,5                | 1,5                 | 1,5                | 138               | 220  | 2400               | 3400 |  | 32017        | 94                      | 93      | 114     | 123     | 126                  | 7       | 7                    | 0.44 | 1,4                | 0.75           | 28 | 1.33  |        |
|                      | 150 | 30,5  | 28 | 24   | 2,5                 | 2,5                | 2                   | 2                  | 167               | 204  | 2400               | 3400 |  | 30217        | 96                      | 95      | 132     | 140     | 142                  | 5       | 6,5                  | 0.42 | 1,4                | 0.79           | 31 | 2.05  |        |
|                      | 150 | 38,5  | 36 | 30   | 2,5                 | 2,5                | 2                   | 2                  | 230               | 315  | 2200               | 3200 |  | 32217        | 95                      | 95      | 130     | 140     | 143                  | 5       | 8,5                  | 0.42 | 1,4                | 0.79           | 34 | 2.70  |        |

# Tapered Roller Bearings

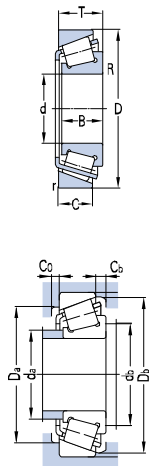


| Principal dimensions |     |       |    |    |                     |                    |                     |                    | Basic rating load |     | Limit rating speed |      |  | Designations | Installation Dimensions |                     |                     |                     |                     |                     |                     |      | Calculation Factor |                |    |       | Weight |
|----------------------|-----|-------|----|----|---------------------|--------------------|---------------------|--------------------|-------------------|-----|--------------------|------|--|--------------|-------------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|------|--------------------|----------------|----|-------|--------|
| d                    | D   | T     | B  | C  | R <sub>radial</sub> | R <sub>axial</sub> | r <sub>radial</sub> | r <sub>axial</sub> | Cr                | Cor | Grease             | Oil  |  |              | d <sub>a(max)</sub>     | d <sub>b(min)</sub> | D <sub>a(min)</sub> | D <sub>a(max)</sub> | D <sub>b(min)</sub> | C <sub>a(min)</sub> | C <sub>b(min)</sub> | e    | Y                  | Y <sub>0</sub> | a  |       |        |
| mm                   |     |       |    |    |                     |                    |                     |                    | KN                |     | r/min              |      |  | mm           |                         |                     |                     |                     |                     |                     |                     | KN   |                    |                | kg |       |        |
| 90                   | 140 | 32    | 32 | 24 | 2                   | 2                  | 1.5                 | 1.5                | 165               | 255 | 2200               | 3200 |  | 32018        | 100                     | 99                  | 122                 | 133                 | 135                 | 7                   | 8                   | 0.42 | 1.4                | 0.78           | 30 | 1.77  |        |
|                      | 140 | 32.4  | 30 | 26 | 2                   | 2                  | 1.5                 | 1.5                | 150               | 196 | 2200               | 3200 |  | 32018X2A     | 100                     | 99                  | 125                 | 131                 | 134                 | 6                   | 8                   | 0.34 | 1.8                | 0.97           | 23 | 1.71  |        |
|                      | 160 | 32.5  | 30 | 26 | 2.5                 | 2.5                | 2                   | 2                  | 222               | 291 | 2000               | 3000 |  | 30218        | 102                     | 100                 | 140                 | 150                 | 151                 | 5                   | 6.5                 | 0.42 | 1.4                | 0.79           | 33 | 2.73  |        |
|                      | 160 | 42.5  | 40 | 34 | 2.5                 | 2.5                | 2                   | 2                  | 274               | 280 | 2000               | 3000 |  | 32218        | 101                     | 100                 | 138                 | 150                 | 152                 | 5                   | 8.5                 | 0.42 | 1.4                | 0.79           | 37 | 3.61  |        |
|                      |     |       |    |    |                     |                    |                     |                    |                   |     |                    |      |  |              |                         |                     |                     |                     |                     |                     |                     |      |                    |                |    |       |        |
| 95                   | 130 | 23    | 22 | 18 | 1.5                 | 1.5                | 1.5                 | 1.5                | 79.5              | 135 | 2300               | 3300 |  | 32919X2A     | 102                     | 103                 | 117                 | 124                 | 126                 | 5                   | 7                   | 0.38 | 1.59               | 0.87           | 25 | 0.786 |        |
|                      | 145 | 32    | 32 | 24 | 2                   | 2                  | 1.5                 | 1.5                | 182               | 292 | 2200               | 3200 |  | 32019        | 105                     | 104                 | 130                 | 138                 | 139                 | 6                   | 8                   | 0.44 | 1.35               | 0.8            | 31 | 1.87  |        |
|                      | 145 | 32.4  | 30 | 26 | 2                   | 2                  | 1.5                 | 1.5                | 161               | 248 | 2200               | 3200 |  | 32019X2A     | 105                     | 104                 | 130                 | 136                 | 140                 | 6                   | 8                   | 0.36 | 1.7                | 0.93           | 33 | 1.80  |        |
|                      | 170 | 34.5  | 32 | 27 | 3                   | 3                  | 2.5                 | 2.5                | 233               | 300 | 1900               | 2800 |  | 30219        | 108                     | 107                 | 149                 | 158                 | 160                 | 5                   | 7.5                 | 0.42 | 1.4                | 0.79           | 35 | 3.27  |        |
|                      |     |       |    |    |                     |                    |                     |                    |                   |     |                    |      |  |              |                         |                     |                     |                     |                     |                     |                     |      |                    |                |    |       |        |
|                      | 150 | 32    | 32 | 24 | 2                   | 2                  | 1.5                 | 1.5                | 190               | 281 | 1600               | 2200 |  | 32020        | 110                     | 109                 | 131                 | 143                 | 145                 | 4.5                 | 8                   | 0.46 | 1.3                | 0.72           | 33 | 1.87  |        |
|                      | 180 | 37    | 34 | 29 | 3                   | 3                  | 2.5                 | 2.5                | 262               | 340 | 1900               | 2800 |  | 30220        | 114                     | 112                 | 157                 | 168                 | 169                 | 5                   | 8                   | 0.42 | 1.4                | 0.79           | 37 | 3.56  |        |
|                      | 180 | 49    | 46 | 39 | 3                   | 3                  | 2.5                 | 2.5                | 345               | 490 | 1800               | 2600 |  | 32220        | 113                     | 112                 | 154                 | 168                 | 172                 | 5                   | 10                  | 0.42 | 1.4                | 0.79           | 42 | 5.31  |        |
|                      |     |       |    |    |                     |                    |                     |                    |                   |     |                    |      |  |              |                         |                     |                     |                     |                     |                     |                     |      |                    |                |    |       |        |
| 105                  | 160 | 35    | 35 | 26 | 2.5                 | 2.5                | 2                   | 2                  | 199               | 320 | 1900               | 2800 |  | 32021        | 116                     | 116                 | 143                 | 150                 | 154                 | 6                   | 9                   | 0.44 | 1.35               | 0.8            | 34 | 2.38  |        |
|                      | 190 | 39    | 36 | 30 | 3                   | 3                  | 2.5                 | 2.5                | 292               | 365 | 1800               | 2600 |  | 30221        | 125                     | 117                 | 162                 | 181                 | 177                 | 6                   | 9                   | 0.42 | 1.4                | 0.79           | 39 | 4.47  |        |
|                      | 190 | 53    | 50 | 43 | 3                   | 3                  | 2.5                 | 2.5                | 385               | 555 | 1800               | 2600 |  | 32221        | 118                     | 117                 | 161                 | 178                 | 182                 | 5                   | 10                  | 0.42 | 1.4                | 0.79           | 45 | 6.34  |        |
|                      |     |       |    |    |                     |                    |                     |                    |                   |     |                    |      |  |              |                         |                     |                     |                     |                     |                     |                     |      |                    |                |    |       |        |
| 110                  | 150 | 25.4  | 24 | 20 | 1.5                 | 1.5                | 1.5                 | 1.5                | 88                | 138 | 2000               | 3000 |  | 32922X2A     | 120                     | 118                 | 138                 | 143                 | 145                 | 7                   | 5.4                 | 0.28 | 2.1                | 1.117          | 23 | 1.18  |        |
|                      | 170 |       | 38 | 29 | 2.5                 | 2.5                | 2                   | 2                  | 231               | 365 | 1800               | 2600 |  | 32022        | 123                     | 120                 | 148                 | 162                 | 164                 | 4.5                 | 9                   | 0.43 | 1.4                | 0.77           | 37 | 3.08  |        |
|                      | 170 | 38.4  | 36 | 31 | 2.5                 | 2.5                | 2                   | 2                  | 198               | 297 | 1800               | 2600 |  | 32022X2A     | 122                     | 120                 | 152                 | 160                 | 163                 | 7                   | 9                   | 0.35 | 1.7                | 0.95           | 33 | 3.10  |        |
|                      | 200 | 41    | 38 | 32 | 3                   | 3                  | 2.5                 | 2.5                | 320               | 430 | 1700               | 2400 |  | 30222        | 132                     | 122                 | 171                 | 191                 | 187                 | 6                   | 9                   | 0.42 | 1.4                | 0.79           | 41 | 5.27  |        |
|                      |     |       |    |    |                     |                    |                     |                    |                   |     |                    |      |  |              |                         |                     |                     |                     |                     |                     |                     |      |                    |                |    |       |        |
| 120                  | 165 | 29    | 29 | 23 | 1.5                 | 1.5                | 1.5                 | 2.5                | 189               | 320 | 1600               | 2200 |  | 32924        | 131                     | 118                 | 150                 | 158                 | 161                 | 4.5                 | 6                   | 0.35 | 1.7                | 0.95           | 29 | 1.79  |        |
|                      | 180 | 38    | 38 | 29 | 2.5                 | 2.5                | 2                   | 2                  | 237               | 395 | 1700               | 2400 |  | 32024        | 132                     | 120                 | 157                 | 172                 | 175                 | 4.5                 | 9                   | 0.46 | 1.3                | 0.72           | 40 | 3.31  |        |
|                      | 180 | 38.4  | 36 | 31 | 2.5                 | 2.5                | 2                   | 2                  | 230               | 325 | 1700               | 2400 |  | 32024X2A     | 131                     | 130                 | 161                 | 170                 | 173                 | 7                   | 9                   | 0.37 | 1.6                | 0.89           | 29 | 3.66  |        |
|                      | 215 | 43.5  | 40 | 34 | 3                   | 3                  | 2.5                 | 2.5                | 330               | 445 | 1600               | 2200 |  | 30224        | 139                     | 132                 | 187                 | 203                 | 203                 | 6                   | 9.5                 | 0.44 | 1.4                | 0.76           | 45 | 6.32  |        |
|                      |     |       |    |    |                     |                    |                     |                    |                   |     |                    |      |  |              |                         |                     |                     |                     |                     |                     |                     |      |                    |                |    |       |        |
| 130                  | 180 | 32.5  | 30 | 26 | 2                   | 2                  | 1.5                 | 1.5                | 150               | 249 | 1700               | 2400 |  | 32926X2A     | 142                     | 139                 | 164                 | 173                 | 174                 | 9                   | 6.5                 | 0.27 | 2.2                | 1.22           | 28 | 2.31  |        |
|                      | 200 | 45    | 45 | 34 | 2.5                 | 2.5                | 2                   | 2                  | 340               | 580 | 1600               | 2200 |  | 32026        | 144                     | 142                 | 178                 | 190                 | 192                 | 7                   | 11                  | 0.43 | 1.4                | 0.8            | 42 | 5.06  |        |
|                      | 200 | 45.5  | 42 | 36 | 2.5                 | 2.5                | 2                   | 2                  | 271               | 420 | 1500               | 2000 |  | 32026X2A     | 144                     | 140                 | 178                 | 190                 | 192                 | 8                   | 11                  | 0.35 | 1.7                | 0.95           | 39 | 4.66  |        |
|                      | 230 | 43.75 | 40 | 34 | 4                   | 4                  | 3                   | 3                  | 360               | 480 | 1500               | 2000 |  | 30226        | 150                     | 144                 | 203                 | 216                 | 219                 | 7                   | 10                  | 0.44 | 1.4                | 0.76           | 47 | 7.02  |        |
|                      | 230 | 67.75 | 64 | 54 | 4                   | 4                  | 3                   | 4                  | 555               | 845 | 1500               | 2000 |  | 32226        | 143                     | 144                 | 193                 | 216                 | 221                 | 7                   | 14                  | 0.44 | 1.4                | 0.76           | 56 | 11.8  |        |
|                      |     |       |    |    |                     |                    |                     |                    |                   |     |                    |      |  |              |                         |                     |                     |                     |                     |                     |                     |      |                    |                |    |       |        |
| 140                  | 190 | 32.5  | 30 | 26 | 2                   | 2                  | 1.5                 | 1.5                | 154               | 257 | 1600               | 2200 |  | 32928X2A     | 142                     | 149                 | 164                 | 183                 | 174                 | 9                   | 6.5                 | 0.27 | 2.2                | 0.22           | 28 | 2.43  |        |
|                      | 190 | 32    | 32 | 25 | 2                   | 2                  | 1.5                 | 1.5                | 206               | 390 | 1600               | 2200 |  | 32928        | 150                     | 150                 | 177                 | 182                 | 184                 | 6                   | 7                   | 0.35 | 1.7                | 0.9            | 33 | 2.55  |        |

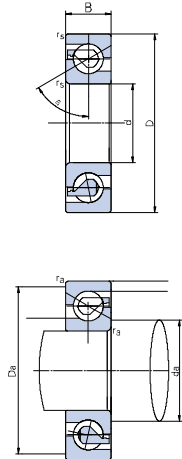
# Tapered Roller Bearings



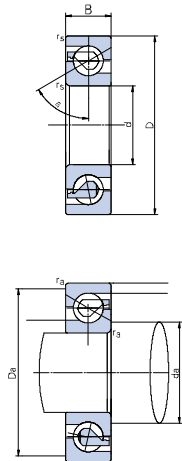
| Principal dimensions |     |       |      |    |                     |                    |                     |                    | Basic rating load |       | Limit rating speed |      |         | Designations | Installation Dimensions |         |         |         |         |         |     |      | Calculation Factor |      |      |       | Weight |    |
|----------------------|-----|-------|------|----|---------------------|--------------------|---------------------|--------------------|-------------------|-------|--------------------|------|---------|--------------|-------------------------|---------|---------|---------|---------|---------|-----|------|--------------------|------|------|-------|--------|----|
| d                    | D   | T     | B    | C  | R <sub>radial</sub> | R <sub>axial</sub> | r <sub>radial</sub> | r <sub>axial</sub> | Cr                | Cor   | Grease             | Oil  | da(max) |              | db(min)                 | Da(min) | Da(max) | Db(min) | Ca(min) | Cb(min) | e   | Y    | Yo                 | a    |      |       |        |    |
| mm                   |     |       |      |    |                     |                    |                     |                    | KN                | r/min |                    |      |         | mm           |                         |         |         |         |         |         |     |      | KN                 |      |      |       |        | kg |
| 140                  | 210 | 45    | 45   | 34 | 2.5                 | 2.5                | 2                   |                    | 330               | 560   | 1600               | 2200 |         | 32028        | 154                     | 150     | 183     | 202     | 4.5     | 11      | 11  | 0.46 | 1.3                | 0.72 | 46   | 5.84  |        |    |
|                      | 210 | 45.5  | 42   | 36 | 2.5                 | 2.5                | 2                   | 2                  | 276               | 440   | 1600               | 2200 |         | 32028X2A     | 153                     | 150     | 187     | 201     | 8       | 11      | 11  | 0.37 | 1.6                | 0.89 | 42   | 4.94  |        |    |
|                      | 250 | 45.75 | 42   | 36 | 4                   | 4                  | 3                   | 3                  | 405               | 540   | 1400               | 1900 |         | 30228        | 162                     | 154     | 219     | 236     | 9       | 11      | 11  | 0.44 | 1.4                | 0.76 | 50   | 8.80  |        |    |
|                      | 250 | 71.75 | 68   | 58 | 4                   | 4                  | 3                   | 3                  | 650               | 1000  | 1400               | 1900 |         | 32228        | 156                     | 154     | 210     | 236     | 8       | 14      | 14  | 0.44 | 1.4                | 0.76 | 61   | 14.7  |        |    |
| 150                  | 210 | 38    | 38   | 30 | 2.5                 | 2.5                | 2                   | 2                  | 270               | 465   | 1500               | 2000 |         | 32930        | 161                     | 160     | 190     | 202     | 9       | 7.5     | 7.5 | 0.33 | 1.83               | 1    | 36   | 3.83  |        |    |
|                      | 210 | 38.5  | 36   | 31 | 2.5                 | 2.5                | 2                   | 2                  | 220               | 385   | 1500               | 2000 |         | 32930X2A     | 165                     | 160     | 191     | 202     | 9       | 7.5     | 7.5 | 0.27 | 2.2                | 1.21 | 33   | 4.56  |        |    |
|                      | 225 | 48    | 48   | 36 | 3                   | 3                  | 2.5                 | 2.5                | 365               | 635   | 950                | 1400 |         | 32030        | 161                     | 160     | 197     | 216     | 9       | 13      | 13  | 0.46 | 1.3                | 0.72 | 49   | 6.40  |        |    |
|                      | 225 | 48.5  | 45   | 38 | 3                   | 3                  | 2.5                 | 2.5                | 280               | 454   | 950                | 1400 |         | 32030X2      | 164                     | 162     | 200     | 213     | 8       | 13      | 13  | 0.39 | 1.5                | 0.85 | 46   | 6.84  |        |    |
|                      | 270 | 49    | 45   | 38 | 4                   | 4                  | 3                   | 3                  | 450               | 605   | 1300               | 1800 |         | 30230        | 174                     | 164     | 234     | 256     | 9       | 11      | 11  | 0.44 | 1.4                | 0.76 | 53   | 11.2  |        |    |
|                      | 270 | 77    | 73   | 60 | 4                   | 4                  | 3                   | 3                  | 735               | 1140  | 1200               | 1700 |         | 32230        | 168                     | 164     | 223     | 256     | 4.5     | 17      | 17  | 0.44 | 1.4                | 0.76 | 64   | 18.4  |        |    |
| 160                  | 220 | 38.5  | 36   | 31 | 2.5                 | 2.5                | 2                   | 2                  | 232               | 400   | 1500               | 2000 |         | 32932X2A     | 175                     | 170     | 203     | 212     | 9       | 7.5     | 7.5 | 0.27 | 2.2                | 1.23 | 34   | 3.79  |        |    |
|                      | 240 | 51    | 51   | 38 | 3                   | 3                  | 2.5                 | 2.5                | 415               | 730   | 1100               | 1600 |         | 32032        | 174                     | 173     | 211     | 231     | 8       | 13      | 13  | 0.46 | 1.3                | 0.72 | 53   | 7.69  |        |    |
|                      | 240 | 51.5  | 48   | 41 | 3                   | 3                  | 2.5                 | 2.5                | 375               | 630   | 1100               | 1600 |         | 32032X2A—1   | 175                     | 172     | 213     | 228     | 8       | 13      | 13  | 0.37 | 1.6                | 0.89 | 47   | 7.67  |        |    |
|                      | 290 | 52    | 48   | 40 | 4                   | 4                  | 3                   | 3                  | 510               | 695   | 1100               | 1600 |         | 30232        | 189                     | 174     | 252     | 276     | 9       | 12      | 12  | 0.44 | 1.4                | 0.76 | 57   | 13.4  |        |    |
|                      | 290 | 84    | 80   | 67 | 4                   | 4                  | 3                   | 3                  | 925               | 1490  | 1100               | 1600 |         | 32232        | 180                     | 174     | 242     | 276     | 10      | 17      | 17  | 0.44 | 1.4                | 0.76 | 70   | 23.3  |        |    |
| 170                  | 230 | 38    | 38   | 30 | 2.5                 | 2.5                | 2                   | 2                  | 280               | 560   | 1400               | 1900 |         | 32934        | 183                     | 182     | 213     | 220     | 7       | 8       | 8   | 0.37 | 1.6                | 0.9  | 42   | 4.51  |        |    |
|                      | 230 | 38.5  | 36   | 31 | 2.5                 | 2.5                | 2                   | 2                  | 235               | 415   | 1400               | 1900 |         | 32934X2A     | 185                     | 180     | 213     | 222     | 9       | 7.5     | 7.5 | 0.28 | 2.1                | 1.17 | 36   | 3.864 |        |    |
|                      | 260 | 57    | 57   | 43 | 3                   | 3                  | 2.5                 | 2.5                | 520               | 870   | 1200               | 1700 |         | 32034        | 188                     | 184     | 230     | 246     | 10      | 14      | 14  | 0.44 | 1.35               | 0.8  | 56   | 10.6  |        |    |
|                      | 260 | 57.5  | 54   | 46 | 3                   | 3                  | 2.5                 | 2.5                | 430               | 750   | 1400               | 1900 |         | 32034X2A     | 187                     | 182     | 230     | 248     | 10      | 14      | 14  | 0.31 | 1.9                | 1.07 | 47   | 10.1  |        |    |
|                      | 310 | 91    | 86   | 71 | 5                   | 5                  | 4                   | 4                  | 1010              | 1630  | 1000               | 1500 |         | 32234        | 196                     | 190     | 259     | 293     | 10      | 20      | 20  | 0.43 | 1.4                | 0.8  | 75   | 30.0  |        |    |
|                      | 180 | 250   | 45   | 45 | 34                  | 2.5                | 2.5                 | 2                  | 2                 | 345   | 725                | 1600 | 2500    |              | 32936                   | 194     | 192     | 225     | 240     | 8       | 11  | 11   | 0.48               | 1.25 | 0.7  | 53    | 6.7    |    |
| 280                  |     | 64.5  | 60   | 52 | 3                   | 3                  | 2.5                 | 2.5                | 520               | 860   | 950                | 1400 |         | 32036X2A     | 199                     | 192     | 247     | 268     | 9       | 16      | 16  | 0.28 | 2.2                | 1.19 | 53   | 13.0  |        |    |
| 290                  |     | 65    | 63.5 | 48 | 2.3                 | 2.3                | 2.3                 | 2.3                | 580               | 1010  | 950                | 1400 |         | 32036X3A     | 207                     | 196     | 247     | 290     | 4.5     | 17      | 17  | 0.44 | 1.4                | 0.75 | 62   | 15.6  |        |    |
| 320                  |     | 57    | 52   | 43 | 5                   | 5                  | 4                   | 4                  | 590               | 820   | 1000               | 1500 |         | 30236        | 209                     | 198     | 278     | 302     | 4.5     | 14      | 14  | 0.45 | 1.3                | 0.73 | 64   | 17.8  |        |    |
| 320                  |     | 91    | 86   | 71 | 5                   | 5                  | 4                   | 4                  | 1020              | 1670  | 950                | 1400 |         | 32236        | 208                     | 196     | 264     | 307     | 10      | 20      | 20  | 0.45 | 1.3                | 0.73 | 78   | 32.3  |        |    |
| 190                  |     | 260   | 45.5 | 42 | 36                  | 2.5                | 2.5                 | 2                  | 2                 | 350   | 670                | 1100 | 1600    |              | 32938X2A                | 205     | 202     | 235     | 252     | 10      | 9.5 | 9.5  | 0.38               | 1.6  | 0.86 | 49    | 6.52   |    |
|                      | 290 | 51    | 46   | 40 | 3                   | 3                  | 2.5                 | 2.5                | 380               | 610   | 950                | 1400 |         | 32038X2A—1   | 215                     | 202     | 256     | 281     | 4.5     | 11      | 11  | 0.38 | 1.6                | 0.87 | 53   | 10.5  |        |    |
|                      | 290 | 64.5  | 60   | 52 | 3                   | 3                  | 2.5                 | 2.5                | 520               | 882   | 1000               | 1500 |         | 32038X2A     | 209                     | 202     | 257     | 278     | 10      | 13      | 13  | 0.37 | 1.6                | 0.89 | 58   | 15.28 |        |    |
|                      | 340 | 60    | 55   | 46 | 5                   | 5                  | 4                   | 4                  | 740               | 1040  | 950                | 1400 |         | 30238        | 229                     | 206     | 294     | 327     | 4.5     | 14      | 14  | 0.44 | 1.4                | 0.76 | 67   | 20.6  |        |    |
|                      | 340 | 97    | 92   | 75 | 5                   | 5                  | 4                   | 4                  | 1100              | 1080  | 950                | 1300 |         | 32238        | 214                     | 208     | 286     | 322     | 10      | 22      | 22  | 0.44 | 1.4                | 0.76 | 81   | 36.1  |        |    |



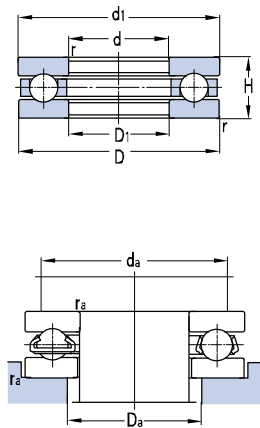
| Principal dimensions |     |       |     |     |                     |                    |                     |                    | Basic rating load |       | Limit rating speed |      |  | Designations | Installation Dimensions |         |         |         |         |         |         |      | Calculation Factor |                |     |      | Weight |
|----------------------|-----|-------|-----|-----|---------------------|--------------------|---------------------|--------------------|-------------------|-------|--------------------|------|--|--------------|-------------------------|---------|---------|---------|---------|---------|---------|------|--------------------|----------------|-----|------|--------|
| d                    | D   | T     | B   | C   | R <sub>radial</sub> | R <sub>axial</sub> | r <sub>radial</sub> | r <sub>axial</sub> | Cr                | Cor   | Grease             | Oil  |  |              | da(max)                 | db(min) | Da(min) | Da(max) | Db(min) | Ca(min) | Cb(min) | e    | Y                  | Y <sub>0</sub> | a   |      |        |
| mm                   |     |       |     |     |                     |                    |                     |                    | KN                | r/min |                    |      |  |              |                         |         |         |         |         | KN      |         |      |                    |                | kg  |      |        |
| 190                  | 280 | 51    | 51  | 39  | 3                   | 3                  | 2.5                 | 2.5                | 455               | 935   | 1000               | 1500 |  | 32940        | 218                     | 215     | 252     | 271     | 270     | 4.5     | 11      | 0.39 | 1.5                | 0.84           | 54  | 9.56 |        |
|                      | 280 | 51.5  | 48  | 41  | 3                   | 3                  | 2.5                 | 2.5                | 380               | 742   | 1000               | 1500 |  | 32940X2A     | 220                     | 212     | 251     | 271     | 270     | 4.5     | 11      | 0.39 | 1.5                | 0.84           | 54  | 8.86 |        |
|                      | 310 | 70.5  | 66  | 56  | 3                   | 3                  | 2.5                 | 2.5                | 575               | 1040  | 950                | 1400 |  | 32040X2A     | 221                     | 212     | 273     | 298     | 297     | 11      | 17      | 0.39 | 1.5                | 0.84           | 65  | 18.2 |        |
|                      | 360 | 64    | 58  | 48  | 5                   | 5                  | 4                   | 4                  | 780               | 1100  | 900                | 1300 |  | 30240        | 236                     | 218     | 315     | 342     | 338     | 9       | 16      | 0.44 | 1.4                | 0.76           | 70  | 25.4 |        |
|                      | 360 | 104   | 98  | 82  | 5                   | 5                  | 4                   | 4                  | 1350              | 2144  | 900                | 1300 |  | 32240        | 222                     | 218     | 302     | 342     | 342     | 11      | 22      | 0.41 | 1.5                | 0.81           | 84  | 42.6 |        |
|                      |     |       |     |     |                     |                    |                     |                    |                   |       |                    |      |  |              |                         |         |         |         |         |         |         |      |                    |                |     |      |        |
|                      | 300 | 51.5  | 48  | 41  | 3                   | 3                  | 2.5                 | 2.5                | 390               | 835   | 900                | 1400 |  | 32944X2A     | 310                     | 232     | 342     | 291     | 361     | 10      | 11      | 0.39 | 1.5                | 0.84           | 66  | 10.1 |        |
|                      | 340 | 76.5  | 72  | 62  | 4                   | 4                  | 3                   | 3                  | 780               | 1330  | 950                | 1400 |  | 32044X2A     | 243                     | 234     | 300     | 326     | 326     | 12      | 19      | 0.35 | 1.7                | 0.95           | 67  | 23.3 |        |
|                      | 400 | 72    | 65  | 54  | 5                   | 5                  | 4                   | 4                  | 975               | 1370  | 900                | 1300 |  | 30244        | 256                     | 220     | 334     | 382     | 382     | 10      | 18      | 0.42 | 1.4                | 0.79           | 77  | 36.8 |        |
|                      | 400 | 114   | 108 | 90  | 5                   | 5                  | 4                   | 4                  | 1650              | 2770  | 900                | 1300 |  | 32244        | 256                     | 220     | 334     | 382     | 382     | 10      | 24      | 0.44 | 1.4                | 0.76           | 96  | 62.7 |        |
|                      |     |       |     |     |                     |                    |                     |                    |                   |       |                    |      |  |              |                         |         |         |         |         |         |         |      |                    |                |     |      |        |
|                      | 320 | 51    | 51  | 39  | 3                   | 3                  | 2.5                 | 2.5                | 500               | 1050  | 850                | 1200 |  | 32948        | 255                     | 254     | 294     | 308     | 311     | 9       | 12      | 0.46 | 1.3                | 0.7            | 64  | 11.5 |        |
|                      | 320 | 51    | 48  | 41  | 3                   | 3                  | 2.5                 | 2.5                | 390               | 790   | 900                | 1300 |  | 32948X2A     | 259                     | 252     | 331     | 387     | 309     | 10      | 11      | 0.32 | 1.9                | 1.04           | 52  | 10.8 |        |
|                      | 360 | 76.5  | 72  | 62  | 4                   | 4                  | 3                   | 3                  | 770               | 1400  | 850                | 1200 |  | 32048X2A     | 261                     | 254     | 318     | 346     | 346     | 12      | 19      | 0.31 | 1.9                | 1.05           | 65  | 23.8 |        |
|                      | 440 | 127   | 120 | 100 | 5                   | 5                  | 4                   | 4                  | 1900              | 3300  | 700                | 950  |  | 32248        | 276                     | 262     | 365     | 420     | 415     | 14      | 27      | 0.43 | 1.4                | 0.8            | 105 | 82.5 |        |
|                      |     |       |     |     |                     |                    |                     |                    |                   |       |                    |      |  |              |                         |         |         |         |         |         |         |      |                    |                |     |      |        |
| 260                  | 360 | 64.5  | 60  | 52  | 3                   | 3                  | 2.5                 | 2.5                | 595               | 1250  | 800                | 1100 |  | 32952X2A     | 286                     | 272     | 325     | 351     | 344     | 13      | 13      | 0.3  | 2                  | 1.09           | 60  | 19.2 |        |
|                      | 400 | 87.7  | 82  | 71  | 5                   | 5                  | 4                   | 4                  | 1050              | 1960  | 800                | 1100 |  | 32052X2A     | 287                     | 278     | 352     | 382     | 383     | 14      | 22      | 0.3  | 2                  | 1.11           | 71  | 37.8 |        |
|                      | 480 | 137   | 130 | 105 | 6                   | 6                  | 5                   | 5                  | 2160              | 3650  | 670                | 900  |  | 32252        | 305                     | 279     | 394     | 465     | 451     | 13      | 32      | 0.43 | 1.4                | 0.77           | 113 | 105  |        |
|                      |     |       |     |     |                     |                    |                     |                    |                   |       |                    |      |  |              |                         |         |         |         |         |         |         |      |                    |                |     |      |        |
| 280                  | 380 | 64.5  | 60  | 52  | 3                   | 3                  | 2.5                 | 2.5                | 600               | 1250  | 800                | 1100 |  | 32956X2A     | 305                     | 292     | 344     | 371     | 364     | 13      | 13      | 0.32 | 1.9                | 1.03           | 64  | 21.3 |        |
|                      | 420 | 87.7  | 82  | 71  | 5                   | 5                  | 4                   | 4                  | 1000              | 1840  | 750                | 1000 |  | 32056X2A     | 305                     | 298     | 370     | 402     | 402     | 14      | 22      | 0.37 | 1.6                | 0.89           | 83  | 39.6 |        |
|                      |     |       |     |     |                     |                    |                     |                    |                   |       |                    |      |  |              |                         |         |         |         |         |         |         |      |                    |                |     |      |        |
| 300                  | 420 | 74.5  | 72  | 62  | 4                   | 4                  | 3                   | 3                  | 710               | 1810  | 700                | 950  |  | 32960        | 330                     | 314     | 379     | 409     | 400     | 13      | 15      | 0.28 | 2.1                | 1.17           | 67  | 30.2 |        |
|                      | 440 | 73    | 70  | 55  | 4                   | 4                  | 3                   | 3                  | 860               | 1460  | 700                | 950  |  | 32960X3B     | 335                     | 314     | 398     | 429     | 423     | 13      | 18      | 0.44 | 1.4                | 0.75           | 87  | 34.2 |        |
|                      | 460 | 100   | 100 | 74  | 5                   | 5                  | 4                   | 4                  | 1460              | 2740  | 670                | 900  |  | 32060        | 330                     | 322     | 404     | 440     | 439     | 15      | 26      | 0.43 | 1.4                | 0.8            | 97  | 56.6 |        |
|                      | 460 | 100.7 | 95  | 77  | 5                   | 5                  | 4                   | 4                  | 1310              | 2400  | 700                | 950  |  | 32060X2A     | 329                     | 318     | 404     | 442     | 439     | 15      | 26      | 0.36 | 1.7                | 0.9            | 89  | 57.0 |        |
|                      |     |       |     |     |                     |                    |                     |                    |                   |       |                    |      |  |              |                         |         |         |         |         |         |         |      |                    |                |     |      |        |
| 320                  | 440 | 76    | 76  | 57  | 4                   | 4                  | 3                   | 3                  | 1000              | 2300  | 850                | 900  |  | 32964        | 343                     | 337     | 402     | 424     | 426     | 13      | 19      | 0.43 | 1.4                | 0.8            | 84  | 34.5 |        |
|                      | 480 | 100   | 100 | 74  | 5                   | 5                  | 4                   | 4                  | 1540              | 2940  | 630                | 850  |  | 32064        | 354                     | 336     | 419     | 467     | 463     | 13      | 26      | 0.46 | 1.3                | 0.72           | 104 | 62.7 |        |
|                      |     |       |     |     |                     |                    |                     |                    |                   |       |                    |      |  |              |                         |         |         |         |         |         |         |      |                    |                |     |      |        |
|                      |     |       |     |     |                     |                    |                     |                    |                   |       |                    |      |  |              |                         |         |         |         |         |         |         |      |                    |                |     |      |        |
|                      |     |       |     |     |                     |                    |                     |                    |                   |       |                    |      |  |              |                         |         |         |         |         |         |         |      |                    |                |     |      |        |
|                      |     |       |     |     |                     |                    |                     |                    |                   |       |                    |      |  |              |                         |         |         |         |         |         |         |      |                    |                |     |      |        |
|                      |     |       |     |     |                     |                    |                     |                    |                   |       |                    |      |  |              |                         |         |         |         |         |         |         |      |                    |                |     |      |        |



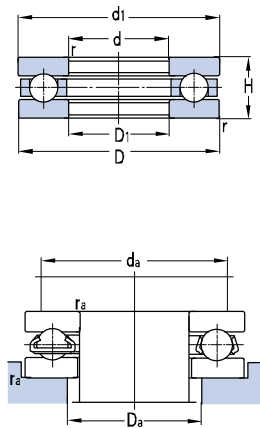
| Principal dimensions |     |    |     |     | Basic rating load |      | Limit rating speed |      | Designations | Contact points<br>a | Installation Dimensions |         |         | Weight<br>kg |
|----------------------|-----|----|-----|-----|-------------------|------|--------------------|------|--------------|---------------------|-------------------------|---------|---------|--------------|
| d                    | D   | B  | r12 | r34 | Cr                | Cor  | Grease             | Oil  |              |                     | da(max)                 | Da(max) | ra(max) |              |
| mm                   |     |    |     |     | KN                |      | r/min              |      |              | mm                  | mm                      | mm      |         |              |
| 20                   | 47  | 14 | 1.0 | 0.6 | 16.0              | 25.0 | 4800               | 5500 | 760204       | 36.1                | 26                      | 42      | 0.6     | 0.12         |
|                      | 47  | 15 | 1.0 | 0.6 | 16.0              | 25.0 | 4800               | 5500 | 760204X2     | 36.6                | 26                      | 42      | 0.6     | 0.13         |
|                      | 52  | 15 | 1.0 | 0.6 | 20.0              | 31.0 | 4300               | 5100 | 760304       | 38.7                | 26                      | 47      | 0.6     | 0.18         |
| 25                   | 52  | 15 | 1.1 | 1.0 | 18.5              | 32.0 | 4000               | 5000 | 760205       | 41                  | 32                      | 46      | 1       | 0.15         |
|                      | 62  | 15 | 1.1 | 1.0 | 23.5              | 41.5 | 3600               | 4800 | 760305X2     | 45.4                | 32                      | 56      | 1       | 0.25         |
|                      | 62  | 17 | 1.1 | 1.0 | 23.5              | 41.5 | 3600               | 4800 | 760305       | 46.4                | 32                      | 56      | 1       | 0.28         |
| 30                   | 62  | 15 | 1.1 | 1.0 | 22.5              | 41.5 | 3350               | 4500 | 760206X2     | 47.5                | 37                      | 56      | 1       | 0.22         |
|                      | 62  | 16 | 1.1 | 1.0 | 22.5              | 41.5 | 3350               | 4500 | 760206       | 48                  | 37                      | 56      | 1       | 0.23         |
|                      | 72  | 19 | 1.1 | 1.0 | 30.0              | 54.5 | 3100               | 4300 | 760306       | 53.9                | 39                      | 65      | 1       | 0.42         |
| 35                   | 72  | 15 | 1.5 | 1.1 | 27.5              | 55.0 | 2800               | 4200 | 760207X2     | 54                  | 44                      | 65      | 1       | 0.31         |
|                      | 72  | 17 | 1.5 | 1.1 | 27.5              | 55.0 | 2800               | 4200 | 760207       | 55                  | 44                      | 65      | 1       | 0.33         |
|                      | 80  | 21 | 1.5 | 1.1 | 36.5              | 100  | 2700               | 4000 | 760307       | 67                  | 44                      | 73      | 1       | 0.54         |
| 40                   | 72  | 15 | 1.1 | 1.0 | 22.5              | 52.0 | 2900               | 4200 | 760208X3     |                     | 49                      | 62.5    | 1.1     | 0.25         |
|                      | 80  | 18 | 1.5 | 1.1 | 32.0              | 66.5 | 2600               | 4000 | 760208       | 61.2                | 49                      | 73      | 1       | 0.42         |
|                      | 90  | 20 | 1.5 | 1.1 | 50.0              | 93.5 | 2400               | 3400 | 760308X2     | 66.6                | 49                      | 83      | 1       | 0.65         |
|                      | 90  | 23 | 1.5 | 1.1 | 48.5              | 93.5 | 2400               | 3350 | 760308       | 68.1                | 49                      | 83      | 1       | 0.72         |
| 45                   | 75  | 15 | 1.5 | 1.1 | 24.5              | 49.5 | 3000               | 4250 | 760209X3     |                     | 52                      | 68      | 1       | 0.27         |
|                      | 85  | 19 | 1.5 | 1.1 | 36.5              | 79.5 | 2400               | 3600 | 760209       | 66                  | 54                      | 78      | 1       | 0.45         |
|                      | 100 | 20 | 1.5 | 1.1 | 60.0              | 170  | 2200               | 3200 | 760309X2     | 75                  | 54                      | 93      | 1       | 0.82         |
|                      | 100 | 25 | 1.5 | 1.1 | 60.0              | 170  | 2100               | 3200 | 760309       | 77.5                | 54                      | 93      | 1       | 1.01         |
| 50                   | 90  | 20 | 1.5 | 1.1 | 37.5              | 84.0 | 2200               | 3100 | 760210       | 70.9                | 60                      | 83      | 1       | 0.54         |
|                      | 100 | 20 | 1.5 | 1.1 | 40.0              | 87.5 | 2000               | 3000 | 760210X1     |                     | 60                      | 103     | 1       | 0.72         |
|                      | 110 | 27 | 1.5 | 1.1 | 65.5              | 120  | 1800               | 2800 | 760310       | 85.5                | 60                      | 103     | 1       | 1.25         |
| 55                   | 90  | 15 | 1.1 | 1.0 | 28.5              | 62.5 | 2400               | 3550 | 760211X3     |                     | 65                      | 80      | 1       | 0.375        |
|                      | 100 | 21 | 1.5 | 1.1 | 40.0              | 81.5 | 2000               | 3200 | 760211       | 77.5                | 65                      | 92      | 1       | 0.76         |
|                      | 120 | 20 | 1.5 | 1.1 | 58.5              | 120  | 1900               | 3000 | 760311X2     |                     | 77                      | 97.5    | 1       | 1.21         |
|                      | 120 | 29 | 1.5 | 1.1 | 70.5              | 145  | 1800               | 2800 | 760311       | 90.7                | 65                      | 112     | 1       | 1.64         |
| 60                   | 110 | 22 | 1.5 | 1.1 | 56.5              | 116  | 1900               | 3000 | 760212       | 86                  | 70                      | 102     | 1       | 0.99         |



| Principal dimensions |     |      |     |     | Basic rating load |      | Limit rating speed |       | Designations | Contact points<br>a | Installation Dimensions |         |         | Weight<br>kg |
|----------------------|-----|------|-----|-----|-------------------|------|--------------------|-------|--------------|---------------------|-------------------------|---------|---------|--------------|
| d                    | D   | B    | r12 | r34 | Cr                | Cor  | Grease             | Oil   |              |                     | da(max)                 | Da(max) | ra(max) |              |
| mm                   |     |      |     |     | KN                |      |                    | r/min |              | mm                  | mm                      | mm      |         |              |
| 60                   | 120 | 20   | 1,5 | 1,1 | 61,0              | 123  | 1800               | 2900  | 760212X3     | 98                  | 79,5                    | 100,5   | 1       | 1,12         |
|                      | 130 | 31   | 1,5 | 1,1 | 89,0              | 175  | 1700               | 2800  | 760312       |                     | 70                      | 122     | 1       | 2,11         |
| 65                   | 120 | 23   | 1,5 | 1,1 | 59,5              | 125  | 1800               | 2850  | 760213       | 92,5                | 75                      | 112     | 1       | 1,18         |
|                      | 140 | 33   | 1,5 | 1,1 | 99,0              | 185  | 1500               | 2650  | 760313       | 107,5               | 75                      | 132     | 1       | 2,65         |
| 70                   | 125 | 24   | 1,5 | 1,1 | 65,5              | 140  | 1800               | 2800  | 760214       | 96,5                | 80                      | 117     | 1       | 96,3         |
|                      | 150 | 35   | 1,5 | 1,1 | 108               | 235  | 1500               | 2600  | 760314       | 113                 | 80                      | 142     | 1       | 3,15         |
| 75                   | 110 | 15   | 1,5 | 1,1 | 35,5              | 85,0 | 1900               | 3000  | 760215X3     |                     | 85                      | 99,5    | 1       | 0,45         |
|                      | 130 | 25   | 1,5 | 1,1 | 67,0              | 155  | 1400               | 2500  | 760215       | 102,5               | 85                      | 122     | 1       | 1,45         |
|                      | 160 | 37   | 1,5 | 1,1 | 125               | 275  | 1200               | 2400  | 760315       | 123                 | 85                      | 152     | 1       | 3,78         |
| 80                   | 140 | 26   | 1,5 | 1,1 | 75,5              | 180  | 1300               | 2500  | 760216       | 109                 | 90                      | 132     | 1       | 1,75         |
|                      | 170 | 39   | 1,5 | 1,1 | 135               | 290  | 1200               | 2400  | 760319       | 129,5               | 90                      | 162     | 1       | 4,52         |
| 85                   | 150 | 28   | 1,5 | 1,1 | 86,5              | 215  | 1300               | 2400  | 760217       | 117                 | 95                      | 148     | 1       | 2,18         |
|                      | 180 | 41   | 1,5 | 1,1 | 158               | 330  | 1200               | 2350  | 760317       | 136                 | 95                      | 172     | 1       | 5,27         |
| 90                   | 160 | 30   | 1,5 | 1,1 | 98,0              | 240  | 1200               | 2400  | 760218       | 124                 | 100                     | 152     | 1       | 2,65         |
|                      | 190 | 43   | 1,5 | 1,1 | 165               | 360  | 1100               | 2200  | 760318       | 142,5               | 100                     | 182     | 1       | 6,15         |
| 95                   | 170 | 32   | 1,5 | 1,1 | 110               | 280  | 1200               | 2300  | 760219       | 131                 | 105                     | 162     | 1       | 3,25         |
|                      | 200 | 45   | 1,5 | 1,1 | 163               | 385  | 1000               | 2100  | 760319       | 150                 | 105                     | 192     | 1       | 7,11         |
| 100                  | 150 | 22,5 | 1,5 | 1,1 | 69,4              | 185  | 1150               | 2000  | 760220X3     |                     | 114,5                   | 135     | 1       | 1,42         |
|                      | 180 | 34   | 1,5 | 1,1 | 123               | 300  | 1000               | 2000  | 760220       | 138                 | 110                     | 170     | 1       | 3,95         |
|                      | 215 | 47   | 1,5 | 1,1 | 190               | 445  | 900                | 1950  | 760320       | 161                 | 110                     | 205     | 1       | 8,78         |
| 110                  | 200 | 38   | 2,1 | 1,5 | 140               | 385  | 950                | 1900  | 760222       |                     | 139                     | 171     | 1,5     | 5,45         |
|                      | 240 | 50   | 2,1 | 1,5 | 245               | 595  | 850                | 1800  | 760322       |                     | 154,5                   | 200     | 1,5     | 11,9         |
| 120                  | 215 | 40   | 2,1 | 1,5 | 175               | 440  | 900                | 1900  | 760224       |                     | 150                     | 185     | 1,5     | 6,4          |
| 130                  | 230 | 40   | 2,1 | 1,5 | 175               | 480  | 850                | 1800  | 760226       |                     | 162,5                   | 197     | 1,5     | 7,2          |
|                      | 280 | 58   | 2,1 | 1,5 | 290               | 700  | 800                | 1750  | 760326       |                     | 181                     | 229     | 1,5     | 18,5         |

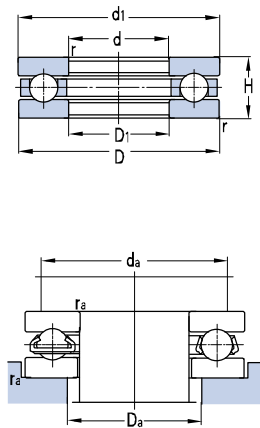


| Principal dimensions |     |    |      | Basic rating load |      |  | Limit rating speed |      | Designations | Other dimensions |    | Installation Dimensions |         |         | Weight |
|----------------------|-----|----|------|-------------------|------|--|--------------------|------|--------------|------------------|----|-------------------------|---------|---------|--------|
| d                    | D   | H  | rmin | Cr                | Cor  |  | Grease             | Oil  |              | d1               | D1 | da(min)                 | Da(max) | ra(max) |        |
| mm                   |     |    |      | KN                |      |  | r/min              |      |              | mm               |    | mm                      |         |         | kg     |
| 25                   | 42  | 11 | 0,6  | 18,2              | 28,0 |  | 4800               | 6300 | 51105        | 42               | 26 | 35                      | 32      | 0,6     | 0,0589 |
|                      | 52  | 18 | 1    | 35,0              | 42,0 |  | 3400               | 4500 | 51305        | 52               | 27 | 41                      | 36      | 1       | 0,165  |
| 30                   | 52  | 16 | 0,6  | 27,3              | 40,0 |  | 3600               | 4800 | 51206        | 52               | 32 | 43                      | 39      | 0,6     | 0,138  |
|                      | 60  | 21 | 1    | 42,5              | 56,0 |  | 2800               | 3800 | 51306        | 60               | 32 | 48                      | 42      | 1       | 0,266  |
|                      | 70  | 28 | 1    | 69,0              | 74,0 |  | 2000               | 3000 | 51406        | 70               | 32 | 54                      | 46      | 1       | 3,94   |
| 35                   | 52  | 12 | 0,6  | 20,8              | 36,0 |  | 4300               | 5600 | 51107        | 52               | 37 | 45                      | 42      | 0,6     | 0,0779 |
|                      | 62  | 18 | 1    | 37,3              | 55,5 |  | 3000               | 4000 | 51207        | 62               | 37 | 51                      | 46      | 1       | 0,193  |
|                      | 68  | 24 | 1    | 55,5              | 73,8 |  | 2400               | 3400 | 51307        | 68               | 37 | 55                      | 48      | 1       | 0,361  |
| 40                   | 60  | 13 | 0,6  | 27,3              | 51,0 |  | 3800               | 5000 | 51108        | 60               | 42 | 52                      | 48      | 0,6     | 0,118  |
|                      | 60  | 13 | 0,6  | 27,3              | 51,0 |  | 3800               | 5000 | 51108M       | 60               | 42 | 52                      | 48      | 0,6     | 0,118  |
|                      | 68  | 19 | 1    | 46,8              | 78,0 |  | 2800               | 3800 | 51208        | 68               | 42 | 57                      | 51      | 1       | 0,273  |
|                      | 68  | 19 | 1    | 46,8              | 78,0 |  | 2800               | 3800 | 51208M       | 68               | 42 | 57                      | 51      | 1       | 0,324  |
|                      | 78  | 26 | 1    | 68,5              | 95,0 |  | 2000               | 2400 | 51308        | 78               | 42 | 63                      | 55      | 1       | 0,521  |
| 45                   | 65  | 14 | 0,6  | 26,7              | 50,0 |  | 3400               | 4500 | 51109        | 65               | 47 | 57                      | 53      | 0,6     | 0,139  |
|                      | 65  | 14 | 0,6  | 26,7              | 50,0 |  | 3400               | 4500 | 51109M       | 65               | 47 | 57                      | 53      | 0,6     | 0,139  |
|                      | 73  | 20 | 1    | 37,0              | 81,0 |  | 2600               | 3600 | 51209        | 73               | 47 | 62                      | 56      | 1       | 0,332  |
|                      | 85  | 28 | 1    | 72,3              | 96,0 |  | 1900               | 2800 | 51309        | 85               | 47 | 69                      | 61      | 1       | 0,656  |
| 50                   | 70  | 14 | 0,6  | 27,3              | 58,0 |  | 3200               | 4300 | 51110        | 70               | 52 | 62                      | 58      | 0,6     | 0,155  |
|                      | 70  | 14 | 0,6  | 27,3              | 58,0 |  | 3200               | 4300 | 51110M       | 70               | 52 | 62                      | 58      | 0,6     | 0,155  |
|                      | 78  | 22 | 1    | 54,6              | 94,0 |  | 2400               | 3400 | 51210        | 78               | 52 | 67                      | 61      | 1       | 0,374  |
|                      | 95  | 31 | 1,1  | 96,2              | 145  |  | 1800               | 2600 | 51310        | 95               | 52 | 77                      | 68      | 1       | 0,942  |
|                      | 110 | 43 | 1,5  | 159               | 197  |  | 1500               | 2000 | 51410M       | 110              | 52 | 86                      | 74      | 1,5     | 1,86   |
| 55                   | 78  | 16 | 0,6  | 33,5              | 72,0 |  | 2800               | 3800 | 51111        | 78               | 57 | 69                      | 64      | 0,6     | 0,226  |
|                      | 78  | 16 | 0,6  | 33,5              | 72,0 |  | 2800               | 3800 | 51111M       | 78               | 57 | 69                      | 64      | 0,6     | 0,226  |
|                      | 90  | 25 | 1    | 68,9              | 123  |  | 1900               | 2800 | 51211        | 90               | 57 | 76                      | 69      | 1       | 0,571  |
|                      | 105 | 35 | 1,1  | 119               | 174  |  | 1600               | 2200 | 51311        | 105              | 57 | 85                      | 75      | 1       | 1,35   |
|                      | 120 | 48 | 1,5  | 191               | 226  |  | 1300               | 1800 | 51411        | 120              | 57 | 94                      | 81      | 1,5     | 2,61   |
| 60                   | 85  | 17 | 1    | 39,5              | 87,0 |  | 2600               | 3600 | 51112        | 85               | 62 | 75                      | 70      | 1       | 0,263  |
|                      | 85  | 17 | 1    | 39,5              | 87,0 |  | 2600               | 3600 | 51112M       | 85               | 62 | 75                      | 70      | 1       | 0,263  |

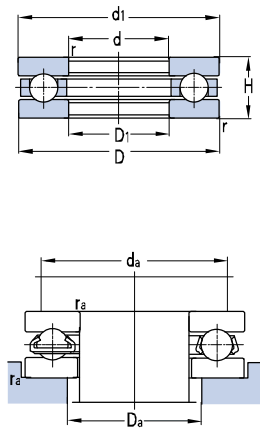


| Principal dimensions |     |    |      | Basic rating load |     |  | Limit rating speed |      | Designations | Other dimensions |    | Installation Dimensions |         |         | Weight |
|----------------------|-----|----|------|-------------------|-----|--|--------------------|------|--------------|------------------|----|-------------------------|---------|---------|--------|
| d                    | D   | H  | rmin | Cr                | Cor |  | Grease             | Oil  |              | d1               | D1 | da(min)                 | Da(max) | ra(max) |        |
| mm                   |     |    |      | KN                |     |  | r/min              |      |              | mm               |    | mm                      |         |         | kg     |
| <b>60</b>            | 95  | 26 | 1    | 74.0              | 141 |  | 1900               | 2800 | 51212        | 95               | 62 | 81                      | 74      | 1       | 0.695  |
|                      | 95  | 26 | 1    | 74.0              | 141 |  | 1900               | 2800 | 51212M       | 95               | 62 | 81                      | 74      | 1       | 0.752  |
|                      | 110 | 35 | 1.1  | 100               | 208 |  | 1600               | 2200 | 51313        | 110              | 62 | 90                      | 80      | 1       | 1.39   |
|                      | 130 | 51 | 1.5  | 200               | 262 |  | 1100               | 1600 | 51412M       | 130              | 62 | 102                     | 88      | 1.5     | 3.48   |
| <b>65</b>            | 90  | 18 | 1    | 45.5              | 103 |  | 2400               | 3400 | 51113        | 90               | 67 | 80                      | 75      | 1       | 0.315  |
|                      | 90  | 18 | 1    | 45.5              | 103 |  | 2400               | 3400 | 51113M       | 90               | 67 | 80                      | 75      | 1       | 0.363  |
|                      | 100 | 27 | 1    | 75.4              | 151 |  | 1800               | 2600 | 51213        | 100              | 67 | 86                      | 79      | 1       | 0.733  |
|                      | 115 | 36 | 1.1  | 107               | 228 |  | 1500               | 2000 | 51313        | 115              | 67 | 95                      | 85      | 1       | 1.54   |
|                      | 140 | 56 | 2    | 239               | 330 |  | 1000               | 1500 | 51413M       | 140              | 68 | 110                     | 95      | 2       | 4.17   |
| <b>70</b>            | 95  | 18 | 1    | 49.4              | 119 |  | 2400               | 3400 | 51114        | 95               | 72 | 85                      | 80      | 1       | 0.351  |
|                      | 95  | 18 | 1    | 49.4              | 119 |  | 2400               | 3400 | 51114M       | 95               | 72 | 85                      | 80      | 1       | 0.377  |
|                      | 105 | 27 | 1    | 76.7              | 161 |  | 1800               | 2600 | 51214        | 105              | 72 | 91                      | 84      | 1       | 0.764  |
|                      | 125 | 40 | 1.1  | 148               | 270 |  | 1400               | 1900 | 51314        | 125              | 72 | 103                     | 92      | 1       | 2.00   |
|                      | 125 | 40 | 1.1  | 148               | 270 |  | 1400               | 1900 | 51314M       | 125              | 72 | 103                     | 92      | 1       | 2.85   |
|                      | 150 | 60 | 2    | 257               | 350 |  | 950                | 1400 | 51414M       | 150              | 73 | 118                     | 102     | 2       | 5.06   |
| <b>75</b>            | 100 | 19 | 1    | 48.1              | 120 |  | 2200               | 3200 | 51115        | 100              | 77 | 90                      | 85      | 1       | 0.382  |
|                      | 100 | 19 | 1    | 48.1              | 120 |  | 2200               | 3200 | 51115M       | 100              | 77 | 90                      | 85      | 1       | 0.382  |
|                      | 110 | 27 | 1    | 64.2              | 173 |  | 1200               | 2400 | 51215        | 110              | 77 | 96                      | 89      | 1       | 0.83   |
|                      | 135 | 44 | 1.5  | 175               | 288 |  | 1900               | 1700 | 51315        | 135              | 77 | 111                     | 99      | 1.5     | 2.61   |
|                      | 160 | 65 | 2    | 251               | 438 |  | 1300               | 2000 | 51415        | 160              | 78 | 126                     | 109     | 2       | 6.61   |
| <b>80</b>            | 105 | 19 | 1    | 49.4              | 130 |  | 2000               | 3000 | 51116        | 105              | 82 | 95                      | 90      | 1       | 0.399  |
|                      | 115 | 28 | 1    | 87.1              | 193 |  | 1700               | 2400 | 51216        | 115              | 82 | 101                     | 94      | 1       | 0.92   |
|                      | 140 | 44 | 1.5  | 182               | 315 |  | 1200               | 1700 | 51316        | 140              | 82 | 116                     | 104     | 1.5     | 2.63   |
|                      | 140 | 44 | 1.5  | 173               | 395 |  | 1200               | 1700 | 51316M       | 140              | 82 | 116                     | 104     | 1.5     | 2.92   |
|                      | 170 | 68 | 1.1  | 317               | 485 |  | 850                | 1200 | 51416        | 170              | 83 | 133                     | 117     | 2       | 7.89   |
| <b>85</b>            | 110 | 19 | 1    | 49.4              | 132 |  | 1600               | 3000 | 51117        | 110              | 87 | 100                     | 95      | 1       | 0.419  |
|                      | 125 | 31 | 1    | 111               | 237 |  | 1100               | 2200 | 51217        | 125              | 88 | 109                     | 101     | 1       | 1.21   |
|                      | 150 | 49 | 1.5  | 223               | 475 |  | 850                | 1600 | 51317        | 150              | 88 | 124                     | 111     | 1.5     | 3.49   |
|                      | 150 | 49 | 1.5  | 223               | 475 |  | 850                | 1600 | 51317M       | 150              | 88 | 124                     | 111     | 1.5     | 3.97   |
|                      | 180 | 72 | 1.1  | 336               | 534 |  | 850                | 1200 | 51417M       | 177              | 88 | 141                     | 124     | 2       | 8.60   |
|                      | 180 | 72 | 1.1  | 336               | 534 |  | 1200               | 1800 | 51417        | 177              | 88 | 141                     | 124     | 2       | 8.35   |

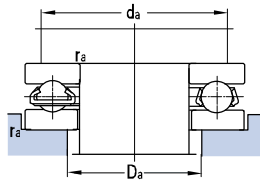
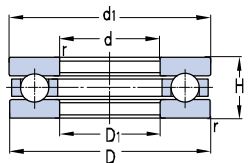




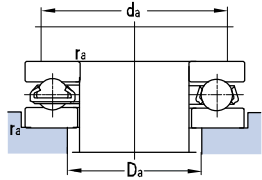
| Principal dimensions |     |     |      | Basic rating load |      | Limit rating speed |      | Designations | Other dimensions |       | Installation Dimensions |         |         | Weight |
|----------------------|-----|-----|------|-------------------|------|--------------------|------|--------------|------------------|-------|-------------------------|---------|---------|--------|
| d                    | D   | H   | rmin | Cr                | Cor  | Grease             | Oil  |              | d1               | D1    | da(min)                 | Da(max) | ra(max) |        |
| mm                   |     |     |      | KN                |      | r/min              |      |              | mm               |       | mm                      |         |         | kg     |
| <b>90</b>            | 120 | 22  | 1    | 65.0              | 170  | 1500               | 2600 | 51118        | 120              | 92    | 108                     | 102     | 1       | 0.632  |
|                      | 120 | 22  | 1    | 65.0              | 170  | 1500               | 2600 | 51118M/P4    | 120              | 92    | 108                     | 102     | 1       | 0.721  |
|                      | 135 | 35  | 1.1  | 132               | 285  | 1000               | 2000 | 51218        | 135              | 93    | 117                     | 108     | 1       | 1.67   |
|                      | 155 | 50  | 1.5  | 232               | 517  | 800                | 1500 | 51318        | 155              | 93    | 129                     | 116     | 1.5     | 4.02   |
|                      | 155 | 50  | 1.5  | 232               | 517  | 800                | 1500 | 51318M       | 155              | 93    | 129                     | 116     | 1.5     | 4.44   |
|                      | 190 | 77  | 2.1  | 381               | 621  | 1100               | 1700 | 51418M       | 187              | 93    | 149                     | 131     | 2       | 9.91   |
| <b>100</b>           | 135 | 25  | 1    | 81.0              | 213  | 1700               | 2400 | 51120        | 135              | 102   | 121                     | 114     | 1       | 0.937  |
|                      | 135 | 25  | 1    | 81.0              | 213  | 1300               | 2400 | 51120M       | 135              | 102   | 121                     | 114     | 1       | 0.937  |
|                      | 150 | 38  | 1.1  | 125               | 347  | 950                | 1800 | 51220        | 150              | 103   | 130                     | 120     | 1       | 2.12   |
|                      | 150 | 38  | 1.1  | 125               | 347  | 950                | 1800 | 51220M       | 150              | 103   | 130                     | 120     | 1       | 2.33   |
|                      | 170 | 55  | 1.5  | 229               | 513  | 950                | 1400 | 51320        | 170              | 103   | 142                     | 128     | 1.5     | 4.85   |
|                      | 170 | 55  | 1.5  | 229               | 513  | 700                | 1400 | 51320M       | 170              | 103   | 142                     | 128     | 1.5     | 4.92   |
|                      | 210 | 85  | 3    | 448               | 775  | 700                | 950  | 51420        | 205              | 103   | 165                     | 145     | 2.5     | 13.6   |
|                      | 172 | 57  | 1.8  | 275               | 513  | 1300               | 1400 | 51820        | 172              | 100.2 | 143                     | 129     | 1.8     | 5.36   |
| <b>110</b>           | 145 | 25  | 1    | 83.0              | 233  | 1200               | 2200 | 51122        | 145              | 112   | 131                     | 124     | 1       | 1.12   |
|                      | 145 | 25  | 1    | 83.0              | 233  | 1200               | 2200 | 51122M       | 145              | 112   | 131                     | 124     | 1       | 1.21   |
|                      | 160 | 38  | 1.1  | 131               | 393  | 850                | 1700 | 51222        | 160              | 113   | 140                     | 130     | 1       | 2.43   |
|                      | 160 | 38  | 1.1  | 131               | 393  | 850                | 1700 | 51222M       | 160              | 113   | 140                     | 130     | 1       | 2.67   |
|                      | 190 | 63  | 2    | 304               | 588  | 850                | 1200 | 51322M       | 187              | 113   | 158                     | 142     | 2       | 7.36   |
|                      | 190 | 63  | 2    | 304               | 588  | 630                | 1200 | 51322        | 187              | 113   | 158                     | 142     | 2       | 7.08   |
|                      | 230 | 95  | 3    | 490               | 900  | 850                | 1600 | 51422M       | 225              | 113   | 181                     | 159     | 2.5     | 18.6   |
| <b>120</b>           | 155 | 25  | 1    | 84.0              | 236  | 1600               | 2200 | 51124        | 155              | 122   | 141                     | 134     | 1       | 1.13   |
|                      | 155 | 25  | 1    | 84.0              | 236  | 1600               | 2200 | 51124M       | 155              | 122   | 141                     | 134     | 1       | 1.25   |
|                      | 170 | 39  | 1.1  | 167               | 399  | 1100               | 2200 | 51224        | 170              | 123   | 150                     | 140     | 1       | 2.71   |
|                      | 210 | 70  | 2.1  | 348               | 711  | 800                | 1100 | 51324M       | 205              | 123   | 173                     | 157     | 2       | 9.85   |
|                      | 210 | 70  | 2.1  | 348               | 711  | 1100               | 1400 | 51324        | 205              | 123   | 173                     | 157     | 2       | 9.43   |
|                      | 250 | 102 | 4    | 536               | 1030 | 600                | 800  | 51424M       | 245              | 123   | 197                     | 173     | 3       | 23.9   |
| <b>130</b>           | 170 | 30  | 1    | 111               | 316  | 1400               | 1900 | 51126M       | 170              | 170   | 154                     | 146     | 1       | 1.86   |
|                      | 170 | 30  | 1    | 111               | 316  | 950                | 1900 | 51126        | 170              | 170   | 154                     | 146     | 1       | 1.67   |
|                      | 190 | 45  | 1.5  | 230               | 535  | 750                | 1400 | 51226        | 187              | 133   | 166                     | 154     | 1.5     | 4.17   |
|                      | 225 | 75  | 2.1  | 394               | 843  | 750                | 1000 | 51326M       | 220              | 134   | 186                     | 169     | 2       | 12.5   |
|                      | 225 | 75  | 2.1  | 394               | 843  | 560                | 1000 | 51326        | 220              | 134   | 186                     | 169     | 2       | 11.6   |



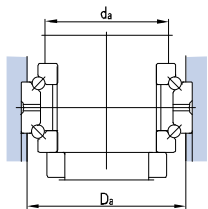
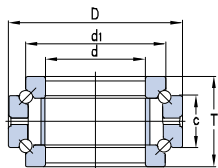
| Principal dimensions |     |     |      | Basic rating load |      |  | Limit rating speed |      | Designations | Other dimensions |     | Installation Dimensions |         |         | Weight |
|----------------------|-----|-----|------|-------------------|------|--|--------------------|------|--------------|------------------|-----|-------------------------|---------|---------|--------|
| d                    | D   | H   | rmin | Cr                | Cor  |  | Grease             | Oil  |              | d1               | D1  | da(min)                 | Da(max) | ra(max) |        |
| mm                   |     |     |      | KN                |      |  | r/min              |      |              | mm               |     | mm                      |         |         | kg     |
| <b>130</b>           | 270 | 110 | 4    | 637               | 1284 |  | 560                | 750  | 51426M       | 265              | 134 | 213                     | 187     | 3       | 29.0   |
|                      | 270 | 110 | 4    | 637               | 1284 |  | 750                | 1400 | 51426        | 265              | 134 | 213                     | 187     | 3       | 28.8   |
| <b>140</b>           | 180 | 31  | 1    | 114               | 344  |  | 1300               | 1800 | 51128        | 178              | 142 | 164                     | 156     | 1       | 1.80   |
|                      | 180 | 31  | 1    | 114               | 344  |  | 950                | 1800 | 51128M       | 178              | 142 | 164                     | 156     | 1       | 2.00   |
|                      | 200 | 46  | 1.5  | 226               | 543  |  | 950                | 1400 | 51228        | 197              | 143 | 176                     | 164     | 1.5     | 4.49   |
|                      | 240 | 80  | 2.1  | 415               | 923  |  | 530                | 950  | 51328        | 235              | 144 | 199                     | 181     | 2       | 14.6   |
|                      | 280 | 112 | 4    | 628               | 1317 |  | 700                | 1200 | 51428M       | 275              | 144 | 223                     | 197     | 3       | 31.6   |
| <b>150</b>           | 190 | 31  | 1    | 117               | 371  |  | 1200               | 1700 | 51130M       | 188              | 152 | 174                     | 166     | 1       | 2.19   |
|                      | 190 | 31  | 1    | 117               | 371  |  | 900                | 1700 | 51130        | 188              | 152 | 174                     | 166     | 1       | 1.96   |
|                      | 215 | 50  | 1.5  | 262               | 651  |  | 900                | 1300 | 51230M       | 212              | 153 | 189                     | 176     | 1.5     | 5.80   |
|                      | 215 | 50  | 1.5  | 262               | 651  |  | 900                | 1300 | 51230        | 212              | 153 | 189                     | 176     | 1.5     | 5.61   |
|                      | 250 | 80  | 2.1  | 429               | 1021 |  | 670                | 900  | 51330M       | 245              | 154 | 209                     | 191     | 2       | 17.0   |
|                      | 250 | 80  | 2.1  | 429               | 1021 |  | 670                | 900  | 51330        | 245              | 154 | 209                     | 191     | 2       | 17.0   |
|                      | 300 | 120 | 4    | 673               | 1479 |  | 500                | 670  | 51430M       | 295              | 154 | 239                     | 211     | 3       | 38.7   |
| <b>160</b>           | 200 | 31  | 1    | 121               | 399  |  | 1200               | 1700 | 51132M       | 198              | 162 | 184                     | 176     | 1       | 2.38   |
|                      | 225 | 51  | 1.5  | 266               | 392  |  | 850                | 1200 | 51232M       | 222              | 163 | 199                     | 186     | 1.5     | 6.19   |
|                      | 225 | 51  | 1.5  | 266               | 392  |  | 850                | 1200 | 51232        | 222              | 163 | 199                     | 186     | 1.5     | 6.08   |
|                      | 270 | 87  | 3    | 455               | 1097 |  | 630                | 850  | 51332M       | 265              | 164 | 225                     | 205     | 2.5     | 18.8   |
| <b>170</b>           | 215 | 34  | 1.1  | 131               | 443  |  | 1100               | 1600 | 51134M       | 213              | 172 | 197                     | 188     | 1       | 2.99   |
|                      | 215 | 34  | 1.1  | 131               | 443  |  | 1100               | 1600 | 51134        | 213              | 172 | 197                     | 188     | 1       | 2.64   |
|                      | 240 | 55  | 1.5  | 281               | 744  |  | 800                | 1100 | 51234M       | 237              | 173 | 212                     | 198     | 1.5     | 7.65   |
|                      | 240 | 55  | 1.5  | 281               | 744  |  | 800                | 1100 | 51234        | 237              | 173 | 212                     | 198     | 1.5     | 7.33   |
|                      | 280 | 87  | 3    | 472               | 1268 |  | 600                | 800  | 51334M       | 275              | 174 | 235                     | 215     | 2.5     | 19.9   |
| <b>180</b>           | 225 | 34  | 1.1  | 151               | 500  |  | 1000               | 1500 | 51136M       | 222              | 183 | 207                     | 198     | 1       | 3.08   |
|                      | 225 | 34  | 1.1  | 151               | 500  |  | 1000               | 1500 | 51136        | 222              | 183 | 207                     | 198     | 1       | 2.86   |
|                      | 250 | 56  | 1.5  | 295               | 825  |  | 800                | 1100 | 51236M       | 247              | 183 | 222                     | 208     | 1.5     | 8.15   |
|                      | 250 | 56  | 1.5  | 295               | 825  |  | 800                | 1100 | 51236        | 247              | 183 | 222                     | 208     | 1.5     | 8.02   |
|                      | 300 | 95  | 3    | 515               | 1436 |  | 560                | 750  | 51336        | 295              | 184 | 251                     | 229     | 2.5     | 26.7   |
| <b>190</b>           | 240 | 37  | 1.1  | 178               | 592  |  | 950                | 1400 | 51138M       | 237              | 193 | 220                     | 210     | 1       | 4.02   |
|                      | 240 | 37  | 1.1  | 178               | 592  |  | 950                | 1400 | 51138        | 237              | 193 | 220                     | 210     | 1       | 3.62   |



| Principal dimensions |     |     |                  | Basic rating load |                 |  | Limit rating speed |      | Designations | Other dimensions |     | Installation Dimensions |                      |                      | Weight |
|----------------------|-----|-----|------------------|-------------------|-----------------|--|--------------------|------|--------------|------------------|-----|-------------------------|----------------------|----------------------|--------|
| d                    | D   | H   | r <sub>min</sub> | C <sub>r</sub>    | C <sub>or</sub> |  | Grease             | Oil  |              | d1               | D1  | d <sub>a</sub> (min)    | D <sub>a</sub> (max) | r <sub>a</sub> (max) |        |
| mm                   |     |     |                  | KN                |                 |  | r/min              |      |              | mm               |     | mm                      |                      |                      | kg     |
| <b>190</b>           | 270 | 62  | 2                | 357               | 1019            |  | 750                | 1000 | 51238M       | 267              | 194 | 238                     | 222                  | 2                    | 11.7   |
|                      | 270 | 62  | 2                | 357               | 1019            |  | 750                | 1000 | 51238        | 267              | 194 | 238                     | 222                  | 2                    | 11.0   |
|                      | 320 | 105 | 4                | 607               | 1662            |  | 700                | 800  | 51338M       | 315              | 195 | 266                     | 244                  | 3                    | 33.5   |
| <b>200</b>           | 250 | 37  | 1.1              | 183               | 636             |  | 950                | 1400 | 51140M       | 247              | 203 | 230                     | 220                  | 1                    | 3.60   |
|                      | 280 | 62  | 2                | 352               | 1029            |  | 750                | 1000 | 51240M       | 277              | 204 | 248                     | 232                  | 2                    | 11.5   |
|                      | 280 | 62  | 2                | 352               | 1029            |  | 750                | 1000 | 51240        | 277              | 204 | 248                     | 232                  | 2                    | 10.9   |
|                      | 340 | 110 | 4                | 660               | 1865            |  | 480                | 630  | 51340M       | 335              | 205 | 282                     | 258                  | 3                    | 30.8   |
| <b>220</b>           | 270 | 37  | 1.1              | 186               | 682             |  | 900                | 1300 | 51144        | 267              | 223 | 250                     | 240                  | 1                    | 4.45   |
|                      | 300 | 63  | 2                | 366               | 1148            |  | 700                | 950  | 51244        | 297              | 224 | 268                     | 252                  | 2                    | 12.9   |
| <b>240</b>           | 300 | 45  | 1.5              | 259               | 927             |  | 800                | 1100 | 51148        | 297              | 243 | 276                     | 264                  | 1.5                  | 7.28   |
|                      | 340 | 78  | 2.1              | 454               | 1483            |  | 630                | 860  | 51248        | 335              | 244 | 299                     | 281                  | 2                    | 21.1   |
|                      | 380 | 112 | 4                | 693               | 2224            |  | 500                | 700  | 51348        | 375              | 245 | 320                     | 300                  | 3                    | 49.6   |
|                      | 340 | 70  | 2.5              | 417               | 1392            |  | 600                | 800  | 51948        | 340              | 238 | 299                     | 281                  | 2.5                  | 19.4   |
| <b>260</b>           | 320 | 45  | 1.5              | 264               | 994             |  | 800                | 1100 | 51152        | 317              | 263 | 296                     | 248                  | 1.5                  | 7.56   |
|                      | 360 | 79  | 2.1              | 474               | 1651            |  | 560                | 750  | 51252        | 355              | 264 | 319                     | 301                  | 2                    | 23.3   |
| <b>280</b>           | 350 | 53  | 1.5              | 337               | 1274            |  | 640                | 900  | 51156        | 347              | 283 | 322                     | 308                  | 1.5                  | 11.4   |
|                      | 380 | 80  | 2.1              | 493               | 1821            |  | 560                | 750  | 51256        | 375              | 284 | 339                     | 321                  | 2                    | 25.3   |
| <b>300</b>           | 380 | 62  | 2                | 416               | 1634            |  | 630                | 850  | 51160        | 376              | 304 | 348                     | 332                  | 2                    | 17.4   |
|                      | 420 | 95  | 3                | 589               | 2245            |  | 480                | 630  | 51260        | 415              | 304 | 371                     | 349                  | 2.5                  | 40.0   |
| <b>320</b>           | 400 | 63  | 2                | 426               | 1756            |  | 600                | 800  | 51164        | 396              | 324 | 368                     | 352                  | 2                    | 18.0   |
| <b>340</b>           | 420 | 64  | 2                | 420               | 1768            |  | 600                | 800  | 51168        | 416              | 344 | 388                     | 372                  | 2                    | 19.9   |
|                      | 460 | 96  | 3                | 604               | 2495            |  | 450                | 600  | 51268        | 455              | 345 | 411                     | 389                  | 2.5                  | 44.6   |
|                      | 540 | 160 | 5                | 1122              | 4439            |  | 400                | 530  | 51368        | 535              | 345 | 452                     | 356                  | 4                    | 137    |
| <b>360</b>           | 440 | 65  | 2                | 430               | 1890            |  | 560                | 750  | 51172        | 436              | 364 | 408                     | 392                  | 2                    | 23.9   |
|                      | 500 | 110 | 4                | 793               | 3591            |  | 400                | 530  | 51272        | 495              | 365 | 442                     | 418                  | 3                    | 64.7   |
| <b>400</b>           | 480 | 65  | 2                | 435               | 2020            |  | 530                | 700  | 51180        | 476              | 404 | 448                     | 432                  | 2                    | 23.0   |

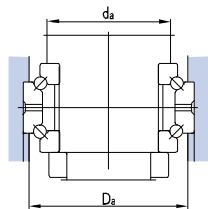
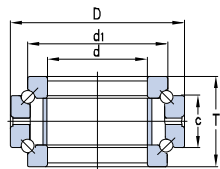


# Double-direction Thrust Angular Contact Ball Bearings



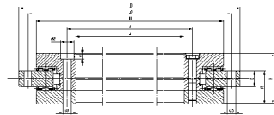
| Principal dimensions |     |    |    |                  |                   | Basic rating load |      |  | Limit rating speed |       | Designations | Dimensions | Installation Dimensions |         |         |         | Weight |
|----------------------|-----|----|----|------------------|-------------------|-------------------|------|--|--------------------|-------|--------------|------------|-------------------------|---------|---------|---------|--------|
| d                    | D   | T  | C  | r <sub>min</sub> | r <sub>1min</sub> | Cr                | Cor  |  | Grease             | Oil   |              | d1         | da(min)                 | Da(max) | ra(max) | ra(max) | kg     |
| mm                   | mm  | mm | mm | mm               | mm                | KN                | KN   |  | r/min              | r/min |              | mm         | mm                      | mm      | mm      | mm      | mm     |
| 50                   | 80  | 38 | 19 | 1                | 0,15              | 27                | 64,5 |  | 5000               | 6700  | 234410       | 70         | 61                      | 76      | 1       | 0,15    | 0,624  |
| 55                   | 90  | 44 | 22 | 1,1              | 0,3               | 37,5              | 85,5 |  | 4500               | 6000  | 234411       | 78         | 68                      | 85      | 1       | 0,3     | 0,949  |
| 60                   | 95  | 44 | 22 | 1,1              | 0,3               | 37,5              | 90   |  | 4300               | 5600  | 234412       | 83         | 73                      | 90      | 1       | 0,3     | 0,989  |
| 65                   | 100 | 44 | 22 | 1,1              | 0,3               | 38,5              | 97,5 |  | 4300               | 5600  | 234413       | 88         | 78                      | 95      | 1       | 0,3     | 1,08   |
| 70                   | 110 | 48 | 24 | 1,1              | 0,3               | 47                | 123  |  | 3800               | 5000  | 234414       | 97         | 85                      | 105     | 1       | 0,3     | 1,51   |
| 75                   | 115 | 48 | 24 | 1,1              | 0,3               | 49                | 131  |  | 3800               | 5000  | 234415       | 102        | 90                      | 110     | 1       | 0,3     | 1,59   |
| 80                   | 125 | 54 | 27 | 1,1              | 0,3               | 57,5              | 157  |  | 3400               | 4500  | 234416       | 110        | 97                      | 119     | 1       | 0,3     | 2,23   |
| 85                   | 130 | 54 | 27 | 1,1              | 0,3               | 58                | 163  |  | 3200               | 4300  | 234417       | 115        | 102                     | 124     | 1       | 0,3     | 2,35   |
| 90                   | 140 | 60 | 30 | 1,5              | 0,3               | 67,5              | 190  |  | 3000               | 4000  | 234418       | 123        | 109                     | 132     | 1,5     | 0,3     | 3,01   |
| 95                   | 145 | 60 | 30 | 1,5              | 0,3               | 68                | 197  |  | 2800               | 3800  | 234419       | 128        | 114                     | 137     | 1,5     | 0,3     | 3,13   |
| 100                  | 150 | 60 | 30 | 1,5              | 1                 | 60,3              | 180  |  | 2900               | 3800  | 234420       | 133        | 119                     | 142     | 1,5     | 0,3     | 3,13   |
|                      | 140 | 48 | 24 | 1                | 0,6               | 52,2              | 168  |  | 2800               | 3700  | 234920       | 126        | 114                     | 134     | 1       | 0,6     |        |
| 105                  | 160 | 66 | 33 | 2                | 0,6               | 109               | 200  |  | 2600               | 3500  | 234421       | 142        | 125                     | 151     | 2       | 0,6     | 4,15   |
|                      | 145 | 48 | 24 | 1                | 0,6               | 53,5              | 235  |  | 2400               | 3400  | 234921       | 121        | 125                     | 151     | 2       | 0,6     |        |
| 110                  | 170 | 72 | 36 | 2                | 0,6               | 95,5              | 280  |  | 2200               | 3200  | 234422       | 150        | 132                     | 161     | 2       | 0,6     | 5,32   |
|                      | 150 | 48 | 24 | 1                | 0,6               | 54                | 174  |  | 2700               | 3600  | 234922       | 136        | 124                     | 144,5   | 1       | 0,6     |        |
| 120                  | 180 | 72 | 36 | 2                | 0,6               | 139               | 265  |  | 2400               | 3200  | 234424       | 160        | 142                     | 171     | 2       | 0,6     | 5,54   |
|                      | 165 | 54 | 27 | 1                | 0,6               | 65                | 215  |  | 2400               | 3200  | 234924       | 150        | 138                     | 159,5   | 1       | 0,6     |        |
| 130                  | 200 | 84 | 42 | 2                | 0,6               | 139               | 405  |  | 1900               | 2800  | 234426       | 177        | 156                     | 190     | 2       | 0,6     | 10,1   |
|                      | 180 | 60 | 30 | 1,5              | 1                 | 74,5              | 255  |  | 2200               | 2900  | 234926       | 163        | 150                     | 173,5   | 1,5     | 0,8     |        |
| 140                  | 210 | 84 | 42 | 2,1              | 0,6               | 144               | 435  |  | 1800               | 2600  | 234428       | 187        | 166                     | 200     | 2       | 0,6     | 9,15   |

# Double-direction Thrust Angular Contact Ball Bearings



| Principal dimensions |     |     |    |                  |                   | Basic rating load |      |  | Limit rating speed |      | Designations | Dimensions | Installation Dimensions |         |         |         | Weight |
|----------------------|-----|-----|----|------------------|-------------------|-------------------|------|--|--------------------|------|--------------|------------|-------------------------|---------|---------|---------|--------|
| d                    | D   | T   | C  | r <sub>min</sub> | r1 <sub>min</sub> | Cr                | Cor  |  | Grease             | Oil  |              | d1         | da(min)                 | Da(max) | ra(max) | ra(max) | kg     |
| mm                   |     |     |    |                  |                   | KN                |      |  | r/min              |      |              | mm         | mm                      |         |         |         |        |
| 140                  | 190 | 60  | 30 | 1.5              | 1                 | 75.5              | 269  |  | 2100               | 2800 | 234928       | 173        | 160                     | 183.5   | 1.5     | 0.8     | 4.57   |
| 150                  | 225 | 90  | 45 | 2.1              | 0.6               | 250               | 390  |  | 1900               | 2500 | 234430       | 200        | 178                     | 213     | 2       | 0.6     | 12.5   |
|                      | 210 | 72  | 36 | 2                | 1                 | 151               | 320  |  | 1800               | 2400 | 234930       | 190        | 172                     | 200     | 2       | 1       | 7.26   |
| 160                  | 240 | 96  | 48 | 2.1              | 1.1               | 241               | 680  |  | 1700               | 2300 | 234432       | 212        | 190                     | 227     | 2       | 0.6     | 14     |
|                      | 220 | 72  | 36 | 2                | 1                 | 109               | 385  |  | 1800               | 2300 | 234932       | 200        | 184                     | 212     | 2       | 1       |        |
| 170                  | 260 | 108 | 54 | 2.5              | 1.3               | 287               | 590  |  | 1600               | 2100 | 234434       | 230        | 206                     | 245     | 2       | 1       | 18.5   |
|                      | 230 | 72  | 36 | 2                | 1                 | 111               | 405  |  | 1700               | 2300 | 234934       | 210        | 194                     | 222     | 2       | 1       | 7.9    |
| 180                  | 280 | 120 | 60 | 2.1              | 0.6               |                   |      |  |                    |      | 234436       | 248        |                         |         |         |         |        |
|                      | 250 | 84  | 42 | 2                | 1                 | 155               | 545  |  | 1500               | 2000 | 234936       | 227        | 207                     | 242     | 2       | 1       | 11.3   |
| 190                  | 290 | 120 | 60 | 2.1              | 0.6               | 235               | 790  |  | 1400               | 1900 | 234438       | 258        | 229                     | 280     | 2       | 1       | 25.7   |
|                      | 260 | 84  | 42 | 2                | 1                 | 157               | 560  |  | 1500               | 2000 | 234938       | 237        | 217                     | 252     | 2       | 1       | 12.3   |
| 200                  | 310 | 132 | 66 | 2.1              | 0.6               | 270               | 915  |  | 1300               | 1700 | 234440       | 274        | 243                     | 300     | 2       | 1       | 33.6   |
|                      | 280 | 96  | 48 | 2                | 1                 | 185               | 655  |  | 1300               | 1800 | 234940       | 252        | 231                     | 270     | 2       | 1       | 17     |
| 220                  | 300 | 96  | 48 | 2                | 1                 | 190               | 715  |  | 1300               | 1700 | 234944       | 272        | 251                     | 290     | 2       | 1       |        |
|                      | 340 | 144 | 72 | 3                | 1                 | 335               | 1120 |  | 1200               | 1500 | 234444       | 304        | 267                     | 330     | 2.5     | 1       | 38.6   |
| 240                  | 320 | 96  | 48 | 2                | 1                 | 196               | 770  |  | 1200               | 1600 | 234948       | 292        | 271                     | 310     | 2       | 1       |        |
|                      | 360 | 144 | 72 | 3                | 1                 | 300               | 1090 |  | 1100               | 1500 | 234448       | 322        | 287                     | 350     | 2.5     | 1       | 46.7   |
| 280                  | 380 | 120 | 60 | 2                | 1                 | 265               | 1080 |  | 980                | 1300 | 234956       | 348        | 319                     | 370     | 2       | 1       |        |
|                      |     |     |    |                  |                   |                   |      |  |                    |      |              |            |                         |         |         |         |        |
| 300                  | 420 | 144 | 72 | 3                | 1                 | 336               | 1360 |  | 840                | 1100 | 234960       | 384        | 349                     | 410     | 2.5     | 1       |        |
|                      |     |     |    |                  |                   |                   |      |  |                    |      |              |            |                         |         |         |         |        |
|                      |     |     |    |                  |                   |                   |      |  |                    |      |              |            |                         |         |         |         |        |
|                      |     |     |    |                  |                   |                   |      |  |                    |      |              |            |                         |         |         |         |        |
|                      |     |     |    |                  |                   |                   |      |  |                    |      |              |            |                         |         |         |         |        |
|                      |     |     |    |                  |                   |                   |      |  |                    |      |              |            |                         |         |         |         |        |

# High Precision Radial And Axial Cylindrical Roller Bearings



| Designations | Dimensions |      |     |       |    |      |     |      | Fixing holes |         |        |                |  | Outer ring | Number of retaining screws | Thread dial<br>fetch hole<br>g      Quantity | Basic rating speed(KN) |         |                |       | Fatigue load     |             | Limit rating speed | Friction Torque | Axial direction rigidity | Radial direction rigidity | Inclined rigidity | Weight |       |                  |
|--------------|------------|------|-----|-------|----|------|-----|------|--------------|---------|--------|----------------|--|------------|----------------------------|----------------------------------------------|------------------------|---------|----------------|-------|------------------|-------------|--------------------|-----------------|--------------------------|---------------------------|-------------------|--------|-------|------------------|
|              | d          | D    | H   | H1    | C  | D1   | J   | J1   | Inner ring   |         |        |                |  |            |                            |                                              | Axial                  |         |                |       | Radial direction |             |                    |                 |                          |                           |                   |        | Axial | Radial direction |
|              | mm         |      |     |       |    |      |     |      | d1 (mm)      | d2 (mm) | a (mm) | Quantity (PCS) |  |            |                            |                                              |                        | d3 (mm) | Quantity (PCS) | (PCS) | Dynamic load     | Static load | Dynamic load       | Static load     | mm                       | NG                        | NM                | KN/m   | KN/m  | KN/mrad          |
| MRTC50       | 50         | 126  | 30  | 20    | 10 | 105  | 63  | 116  | 5.6          |         |        | 10             |  | 5.6        | 12                         | 2                                            |                        | 56      | 280            | 28.5  | 49.5             | 33          | 7.1                | 440             | 2.5                      | 0.25                      | 1.1               | 1.25   | 1.6   |                  |
| MRTC80       | 80         | 146  | 35  | 23.35 | 12 | 130  | 92  | 138  | 5.6          | 10      | 4      | 10             |  | 4.6        | 12                         | 2                                            |                        | 38      | 158            | 44    | 98               | 15.3        | 13                 | 350             | 3                        | 0.5                       | 1.8               | 2.5    | 2.4   |                  |
| MRTC100      | 100        | 185  | 38  | 25    | 12 | 160  | 112 | 170  | 5.6          | 10      | 5.4    | 16             |  | 5.6        | 15                         | 2                                            | M5                     | 3       | 73             | 370   | 52               | 108         | 40.5               | 14.4            | 280                      | 3                         | 0.8               | 2      | 5     | 4.1              |
| MRTC120      | 120        | 210  | 40  | 26    | 12 | 184  | 135 | 195  | 7            | 11      | 6.2    | 22             |  | 7          | 21                         | 2                                            | M8                     | 3       | 80             | 445   | 70               | 148         | 46.5               | 18.3            | 230                      | 7                         | 1                 | 2.2    | 7     | 5.3              |
| MRTC150      | 150        | 240  | 40  | 26    | 12 | 214  | 165 | 225  | 7            | 11      | 6.2    | 34             |  | 7          | 33                         | 2                                            | M8                     | 3       | 85             | 510   | 77               | 179         | 50                 | 21              | 210                      | 10                        | 1.5               | 2.6    | 11    | 6.2              |
| MRTC180      | 180        | 280  | 43  | 29    | 15 | 244  | 194 | 260  | 7            | 11      | 6.2    | 46             |  | 7          | 45                         | 2                                            | M8                     | 3       | 92             | 580   | 83               | 209         | 56                 | 23.3            | 190                      | 12                        | 2.2               | 3      | 17    | 7.7              |
| MRTC200      | 200        | 300  | 45  | 30    | 15 | 274  | 215 | 285  | 7            | 11      | 6.2    | 46             |  | 7          | 45                         | 2                                            | M8                     | 3       | 98             | 650   | 89               | 236         | 61                 | 25.5            | 170                      | 14                        | 3                 | 3.5    | 23    | 9.7              |
| MRTC260      | 260        | 385  | 55  | 36.5  | 18 | 345  | 280 | 365  | 9.3          | 15      | 8.2    | 34             |  | 9.3        | 33                         | 2                                            | M12                    | 3       | 109            | 810   | 102              | 310         | 71                 | 31              | 130                      | 20                        | 5.5               | 4.5    | 45    | 18.3             |
| MRTC325      | 325        | 450  | 60  | 40    | 20 | 415  | 342 | 430  | 9.3          | 15      | 8.2    | 34             |  | 9.3        | 33                         | 2                                            | M12                    | 3       | 186            | 1710  | 134              | 415         | 131                | 38.5            | 110                      | 40                        | 8.5               | 5      | 80    | 25               |
| MRTC395      | 395        | 525  | 65  | 42.5  | 20 | 486  | 415 | 505  | 9.3          | 15      | 8.2    | 46             |  | 9.3        | 45                         | 2                                            | M12                    | 3       | 202            | 2010  | 133              | 435         | 146                | 43.5            | 90                       | 55                        | 12.5              | 6      | 130   | 33               |
| MRTC460      | 460        | 600  | 70  | 46    | 22 | 560  | 482 | 580  | 9.3          | 15      | 8.2    | 46             |  | 9.3        | 45                         | 2                                            | M12                    | 3       | 217            | 2300  | 187              | 650         | 161                | 59              | 80                       | 70                        | 18                | 7      | 200   | 45               |
| MRTC580      | 580        | 750  | 90  | 60    | 30 | 700  | 610 | 720  | 11.4         | 18      | 11     | 46             |  | 11.4       | 42                         | 2                                            | M12                    | 6       | 390            | 3600  | 211              | 820         | 206                | 69              | 60                       | 140                       | 30                | 9      | 380   | 89               |
| MRTC650      | 650        | 870  | 122 | 78    | 34 | 800  | 680 | 830  | 14           | 20      | 13     | 46             |  | 14         | 42                         | 2                                            | M12                    | 6       | 495            | 5200  | 415              | 1500        | 285                | 113             | 55                       | 200                       | 45                | 10     | 550   | 170              |
| MRTC850      | 850        | 1095 | 124 | 80.5  | 37 | 1018 | 890 | 1055 | 18           | 26      | 17     | 58             |  | 18         | 54                         | 2                                            | M16                    | 6       | 560            | 6600  | 475              | 1970        | 340                | 136             | 40                       | 300                       | 80                | 13     | 1100  | 253              |
| MRTC950      | 950        | 1200 | 132 | 86    | 40 | 1130 | 990 | 1160 | 18           | 26      | 17     | 58             |  | 18         | 54                         | 2                                            | M16                    | 6       | 1040           | 10300 | 600              | 2450        | 510                | 162             | 40                       | 600                       | 100               | 14     | 1500  | 312              |